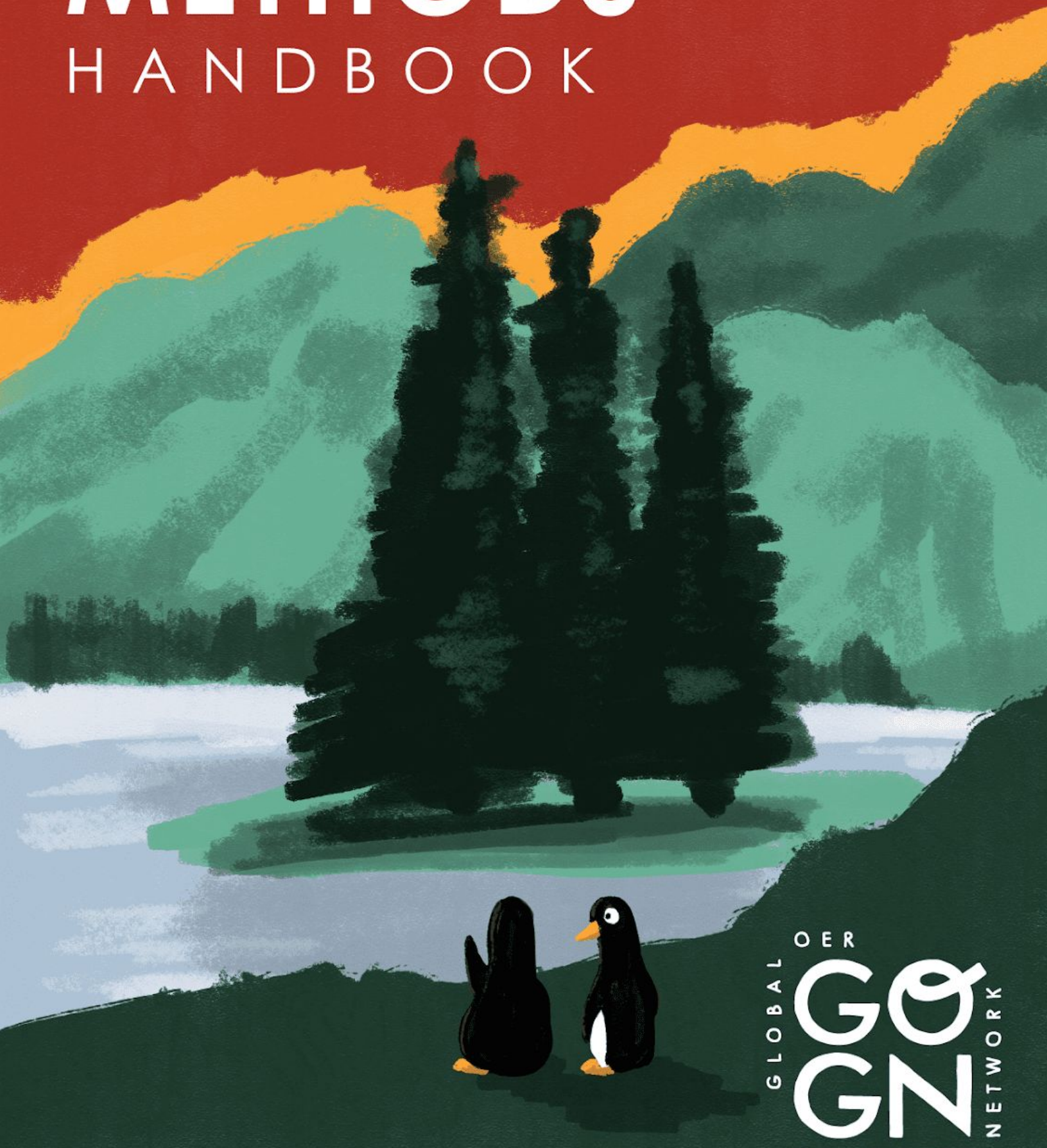
GO-GN Research Methods Handbook

Book

RESEARCH METHODS

HANDBOOK



GLOBAL OER GRADUATE NETWORK

GO-GN

Research Methods Handbook

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Introduction

Methodology can be one of the most challenging aspects for doctoral researchers. When we conduct research into education and/or technology, we can be confronted with a potentially confusing array of options. This is true even for those using a well-established approach, but can be especially acute if combining approaches in a mixed-methods study or trying to develop a completely new way of doing research.

It can also be hard to raise concerns about methods with supervisors and/or peers. There can be a strong sense that, by the time you are a doctoral scholar, this is something you should have mastered. After all, haven't you been learning about your chosen field for a long time by now? Not feeling confident about research methods can be a route to the dreaded 'imposter syndrome'.

Arguably, methodology is an instance where we should never feel too comfortable, because we would no longer be critically engaging with those aspects of research that convey and ensure the validity and trustworthiness of the conclusions we draw. Depending on our research interests we might want to explore phenomena "horizontally" across a large quantitative dataset, or "vertically" by generating qualitative descriptions of particular cases. Choosing the right method for what we are interested in is a key part of high quality research, and this requires us to think about the scientific and philosophical foundations of what we do.

In this guide we explore some of these issues with a focus on open research, drawing on insights from researchers within the Global OER Graduate Network (GO-GN). Open practices in research can challenge assumptions about how to create and share new knowledge. In this handbook, we draw on insights from experienced open researchers to build understanding of research in the open. The advice given applies to all research, but is of particular relevance to those interested in open approaches.

GO-GN is a network of PhD candidates around the world whose research projects include a focus on open education. These doctoral researchers are at the core of the network; around them, over two hundred experts, supervisors, mentors and interested parties connect to form a community of practice that:

- Raises the profile of research into open education
- Offers support for those conducting PhD research in this area
- Develops openness as a process of research

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Conceptualising Research Methods

What is a 'research method'? The simple answer is to say that it is how someone did a particular piece of research, investigated a topic or attempted to answer a question. This could describe a specific part of the process or it can relate to the process as a whole. Research methods can vary greatly but they all attempt to gather information in order to provide answers that are systematic and reliable.

Research methods are important because they provide the underlying validity for what we do. This is why it is important to critically engage with methodology.

Most of the time, when people talk about 'research methods' they refer to aspects like:

- An approach or technique for conducting research
- How a study is completed
- How data was collected and analysed
- How findings were reported

Choosing a method is just the tip of the iceberg when it comes to the deeper justification for ways of doing research. At a more abstract level, these elements are supporting the wider claims made by a piece of research. This includes elements like:

- Testing a hypothesis
- Supporting a claim to new knowledge
- Being reproducible by others

To understand this at a more reflective level, you have to think about methodology. It is important to ground your methodology on a firm basis, and this section will help you understand how your methodology relates to broader beliefs about knowledge. However, it does require a dive into philosophy so if you are just interested in looking at specific methods you may want to skip to a later section.

Methodology is the systematisation, analysis and comparison of different methods. Methods can be closely associated with particular worldviews or ideologies. There are necessarily philosophical and theoretical aspects to this, and this can be intimidating at times, but it's important to critically engage with these questions to improve the quality of research.

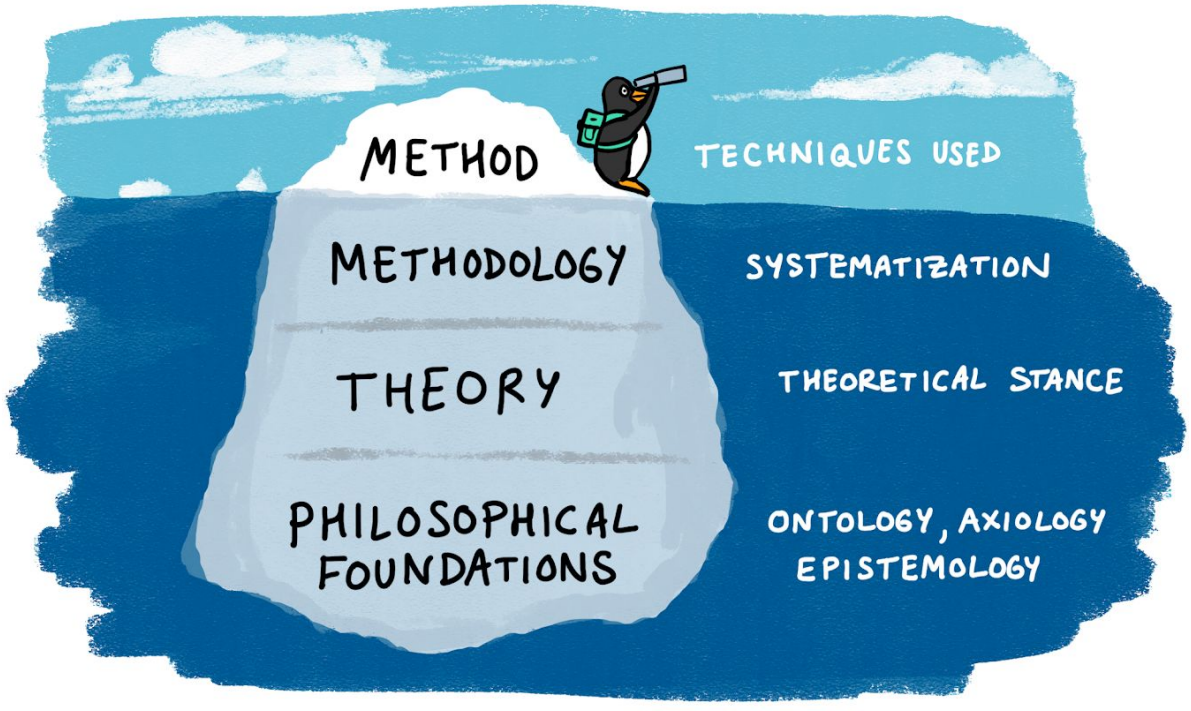


Figure 1. Conceptualising Research Method, Methodology, Theory and Philosophical Foundations

There are three elements to the philosophical foundation of a research method: Ontology, Epistemology and Axiology (Crotty, 1998; Guba & Lincoln, 1994; Heron & Reason, 1997).

Here are some simple explanations for what these terms mean.

Ontology

Ontology refers to the study of being (literally, it means "rational discourse about being"). In philosophy, basic questions about existence are typically posed as ontological, e.g.:

- What is there?
- What types of things are there?
- How can we describe existence?
- What kind of categories can things go into?
- Are the categories of existence hierarchical?

This approach to ontology can be considered fundamental in that it underlies our experiences of the world and our beliefs about it. Ontology in philosophy refers to existential matters and questions about the nature of existence. Domain ontology describes concepts and articles relevant to a particular discipline (e.g. a branch of science). Particular domain ontologies can be thought of as arising from

philosophical approaches to Ontology but then becoming distinct areas in themselves. (Smith, 2009). This explains how scientific approaches often suspend discussion of more basic ontological questions but they are still underpinned by them. Similarly, Interface ontology describes concepts and articles relevant to several disciplines, and might be used in interdisciplinary or multidisciplinary research.

So, what's the point of ontology in educational research? In applied science, ontologies are used to describe the different entities and domains within a particular system or investigation. Simply put, before we can study a phenomenon we need to define it. Within a particular study we focus on the specific thing(s) under investigation and how we define the parameters of a study. While most researchers won't need to engage at length in philosophising about ontology, it's an important consideration when choosing an approach because it partly determines what constitutes validity in a particular study.[1]

Epistemology

Epistemology is derived from the Ancient Greek *epistēmē* which refers to systematic or reliable knowledge (as opposed to doxa, or "belief"). The research concept here is "rational discourse about knowledge" and the focus is the study of knowledge and methods used to generate knowledge.

Epistemology has a history as long as Philosophy, and in many ways is the foundation of both scientific and philosophical knowledge.

[1] Ontology is considered part of what philosophers call Metaphysics. Metaphysics is about the fundamental nature of reality. Metaphysics is a long-contested term – difficult to define – which many have suggested is meaningless in the face of modern (quantitative) science. The traditional domains of metaphysics include theories explaining relationships, states of being; causation; phenomena; categories of being (e.g. spatio-temporality; minds; identity; necessity & possibility; freedom; essence).

While scientists don't really see themselves as doing metaphysics, there is almost always some metaphysics involved in science, even if it is very abstract. If you want to go deeper into this, there's a useful summary on the Internet Encyclopedia of Philosophy at https://www.iep.utm.edu/met-scie/.

Epistemological questions include:

- What is knowledge?
- How can we claim to know anything at all?
- What does it mean to know something?
- What makes a belief justified?
- What is the relationship between the knower and what can be known?

While the philosophical dimensions can be abstract and generalized, thinking about these kinds of questions in the context of research makes them more targeted because it enables you to align specific methods against specific questions more appropriately. Epistemology is closely connected to method as they are both concerned with knowledge creation and validation (broadly construed). Research methods are essentially epistemologies – by following a certain process we support our claim to know about the thing(s) we have been researching. Inappropriate or poorly followed methods can undermine claims to have produced new knowledge or discovered a new truth. This can have implications for future studies that build on the data and/or conceptual framework used.

Research methods can be thought of as essentially stripped down, purpose-specific epistemologies. Research attempts to add to knowledge. However, it's important to note that methods and epistemologies are accompanied by ontological (and often axiomatic) commitments. One key consideration here is the status of 'truth' within a particular epistemology or research method. If, for instance, some approaches emphasize subjective knowledge and deny the possibility of an objective truth, what does this mean for choosing a research method? We'll discuss this in more detail in the section on Research Paradigms.

Axiology

Axiology is the study of values and value judgements (literally "rational discourse about values [*axía*]"). In philosophy this field is subdivided into ethics (the study of morality) and aesthetics (the study of beauty, taste and judgement). For the hard-nosed scientist the relevance of axiology might not be obvious. After all, what difference do one's feelings make for the data collected? Don't we spend a long time trying to teach researchers to be objective?

Like ontology and epistemology, the import of axiology is typically built into research paradigms and exists "below the surface". You might not consciously engage with values in a research project, but they are still there. Similarly, you might not hear many researchers refer to their axomatic commitments but they might well talk about their values and ethics, their positionality, or a commitment to social justice.

Our values focus and motivate our research. These values could include a commitment to scientific rigour, or to always act ethically as a researcher. At a more general level we might ask: What matters? Why do research at all? How does it contribute to human wellbeing?

Almost all research projects are grounded in trying to answer a question that matters or has consequences. Some research projects are even explicit in their intention to improve things rather than observe them; this is most closely associated with "critical" approaches.

Research Paradigms

A lot of effort can be spent refining and calibrating a research question to fully understand what kind of data could be collected and what kind of validity analysis might offer when answering the question. Researchers rarely proceed by choosing an ontology, epistemology and axiology separately and then deciding which research method to apply. Instead, the starting point will usually be a research question framed within a particular paradigm. It's also common in practice for researchers to identify the method they will use (perhaps determined by the data that is available) and then articulate the theoretical justification behind it by drawing on a paradigm.

Kuhn's (1962) The Structure of Scientific Revolutions is one of the most influential works on the philosophy of science, and is credited with introducing the idea of competing paradigms (or "disciplinary matrices") in research. Kuhn investigated the way that scientific practices evolve over time, arguing that we don't have a simple progression from "less knowledge" to "more knowledge" because the way that we approach inquiry is changing over time. This can happen gradually, but results in moments of change where our understanding of a phenomenon changes more radically (such as in the transition from Newtonian to Einsteinian physics; or from Lamarckian to Darwinian theories of evolution).

There are four stages in the cycle of science in Kuhn's approach. Firstly, a pre-paradigmatic state where competing approaches share no consensus. Secondly, the "normal" state where there is wide acceptance of a particular set of methods and assumptions. Thirdly, a state of crisis where anomalies that cannot be solved within the existing paradigm emerge and competing theories to address them follow. Fourthly, a revolutionary phase where some new paradigmatic approach becomes dominant and supplants the old. Schnieder (2009) suggests that the Kuhnian phases are characterised by different kinds of scientific activity.

Newer approaches often build upon rather than replace older ones, but they also overlap and can exist within a state of competition. Scientists working within a particular paradigm often share methods, assumptions and values. In addition to supporting specific methods, research paradigms also influence things like the ambition and nature of research, the researcher-participant relationship and how the role of the researcher is understood.

For studies that look into paradigmatic change within open education research, see Bozkurt (2019) and Weller et al. (2018). Next we will go on to look at methods associated with different research paradigms.

Paradigmatic Methods

There are several dominant paradigms in education research and four (Positivism, Interpretivism, Critical and Pragmatic) are outlined here. Positivism and Interpretivism are distinguished by their different approaches to data collection and underlying ontological and epistemological commitments. The difference between Positivism and Interpretivism is a good place to start, since Critical and Pragmatic approaches build on these.

Positivism / Post-positivism

Positivism has its roots in the scientific revolution of the Enlightenment. Positivism is based on the idea that we can come to know facts about the natural world through our experiences of it. The processes that support this are the logical and analytic classification and systemisation of these experiences. Through this process of empirical analysis, Positivists aim to arrive at descriptions of law-like relationships and mechanisms that govern the world we experience.

Positivists have traditionally claimed that the only authentic knowledge we have of the world is empirical and scientific. This was partly a response to the historical primacy of metaphysics as a way to explain the world. Essentially, Positivism downplays any gap between our experiences of the world and the way the world really is and takes it that we determine objective "facts" through the correct methodological combination of observation and analysis. Data collection methods typically include quantitative measurement, which is supposed to overcome the individual biases of the researcher.

Positivism aspires to high standards of validity and reliability supported by evidence, and has been applied extensively in both physical and social sciences. The advantage of such approaches lies in an iteratively expanding evidence base, and a deep epistemological separation between "the knower" and "what is known" which supports the idea that what has been discovered is "true" and not just the opinion of a researcher. However, the criticism often made of Positivism with regard to human and social sciences (e.g. education, psychology, sociology) is that Positivism is scientistic; which is to say that in pursuit of "hard" science it fails to recognise that many aspects of human experience don't conform to this way of collecting data. Similarly, it's hard to guarantee that research design is ever completely free from human bias.

Kivunja & Kuyini (2017) describe the essential features of Positivism as:

- A belief that theory is universal and law-like generalisations can be made across contexts
- The assumption that context is not important
- The belief that truth or knowledge is 'out there to be discovered' by research
- The belief that cause and effect are distinguishable and analytically separable
- The belief that results of inquiry can be quantified
- The belief that theory can be used to predict and to control outcomes
- The belief that research should follow the Scientific Method of investigation
- Rests on formulation and testing of hypotheses
- Employs empirical or analytical approaches
- Pursues an objective search for facts
- Believes in ability to observe knowledge
- The researcher's ultimate aim is to establish a comprehensive universal theory, to account for human and social behaviour
- Application of the scientific method

Many quantitative researchers now identify as Post-Positivist. Post-Positivism retains the idea that truth should be considered objective, but asserts that our experiences of such truths are necessarily imperfect because they are ameliorated by our values and experiences. Post-Positivists are more likely to use mixed methods and triangulation of quantitative and qualitative data, accepting the problematic nature of "objective" truths. A popular form of Post-Positivism is Critical Realism, which lies between Positivism and Interpretivism.

Positivist Methods: Document coding; Experimental & Quasi-experimental design; Isolating & measuring variables; Statistical analysis; Structured interviews; Surveys

Interpretivism

Often contrasted with Positivism is Interpretivism. The starting point for Interpretivism - which is sometimes called Anti-Positivism - is that knowledge in the human and social sciences cannot conform to the model of natural science because there are features of human experience that cannot objectively be "known". This might include emotions; understandings; values; feelings; subjectivities; socio-cultural factors; historical influence; and other meaningful aspects of human being. Instead of finding "truth" the Interpretivist aims to generate understanding and often adopts a relativist position.

Qualitative methods are preferred as ways to investigate these phenomena. Data collected might be unstructured (or "messy") and correspondingly a range of techniques for approaching data collection have been developed. Interpretivism

acknowledges that it is impossible to remove cultural and individual influence from research, often instead making a virtue of the positionality of the researcher and the socio-cultural context of a study.

One key consideration here is the purported validity of qualitative research. Interpretivism tends to emphasize the subjective over the objective. If the starting point for an investigation is that we can't fully and objectively know the world, how can we do research into this without everything being a matter of opinion? Essentially Positivism and Interpretivism retain different ontologies and epistemologies with contrasting notions of rigour and validity (in the broadest rather than statistical sense). Interpretivist research often embraces a relativist epistemology, bringing together different perspectives in search of an overall understanding or narrative.

Kivunja & Kuyini (2017) describe the essential features of Interpretivism as:

- The admission that the social world cannot be understood from the standpoint of an individual
- The belief that realities are multiple and socially constructed
- The acceptance that there is inevitable interaction between the researcher and his or her research participants
- The acceptance that context is vital for knowledge and knowing.
- The belief that knowledge is created by the findings, can be value laden and the values need to be made explicit
- The need to understand the individual rather than universal laws
- The belief that causes and effects are mutually interdependent
- The belief that contextual factors need to be taken into consideration in any systematic pursuit of understanding

Interpretivism as a research paradigm is often accompanied by Constructivism as an ontological and epistemological grounding. Many learning theories emphasize Constructivism as an organising principle, and Constructivism often underlies aspects of educational research.

Interpretivist Methods: Case Studies; Conversational analysis; Delphi; Description; Document analysis; Interviews; Focus Groups; Grounded theory; Phenomenography; Phenomenology; Thematic analysis

Figure 2 provides a comparison of the characteristic philosophical and methodological aspects of Positivism and Interpretivism.

	Positivism	Interpretivism
Ontology		
Being in the world	Direct access (Naturalism)	Indirect access (Idealism)
Reality	Objective, accessible	Subjectively experienced
Epistemology		
Relation between knowledge and reality	Objective knowledge of the world is possible supported by appropriate method	Objective knowledge of the world is possible supported by appropriate method
Epistemological goals	Generalisation, abstraction, discovery of law-like relationships	Knowledge of specific, concrete cases and examples
Basic approach	Hypothesis formation and testing	Describing and seeking to understand phenomena in context
Methodology		
Focus	Description and explanation	Understanding and interpretation
Research Perspective	Detached, objective	Embedded in the phenomena under investigation
Role of emotions	Strict separation between the cognitions and feeling of the researchers	Emotional response can be part of coming to understanding
Limits of researcher influence	Discovery of external, objective reality - minimal influence	Object of study is potentially influenced by the activity of the researcher
Valued approaches	Consistency, clarity, reproducibility, rationality, lack of bias	Insight, appreciation of context and prior understanding
Fact/value distinction	Clear distinction between facts and values	Distinction is less rigid, acknowledges entanglement
Archetypal research methods	Quantitative (e.g. statistical analysis)	Qualitative (e.g. case study)

Figure 2. Ontology, Epistemology and Methodology across Positivism and Interpretivism (adapted from Carson et al., 2001)

Critical / Transformational

This paradigm is most closely associated with the intellectual history that includes Critical Theory, Marxism, Feminism, Critical Pedagogy, and Critical Realism. Within critical approaches, axiology, positionality and values are foregrounded. In contrast with the detached, "objective" observations associated with the positivist researcher, critical approaches make explicit the intention for research to act as a transformative or emancipatory force at a social level. This might involve the way a research project is framed (for instance, as motivated by an interest in social justice) or the kind of data that is collected (e.g. metrics on age, gender, sexuality, or race that can be used to illuminate inequality). Methods used by critical researchers are often interdisciplinary, combining Positivist and Interpretivist techniques to describe contextual and historical factors. In addition, there are some methods which belong distinctively to the critical paradigm (see below).

Critical Methods: Action research; Critical ethnology; Deconstruction; Dialectics; Field research; Textual analysis

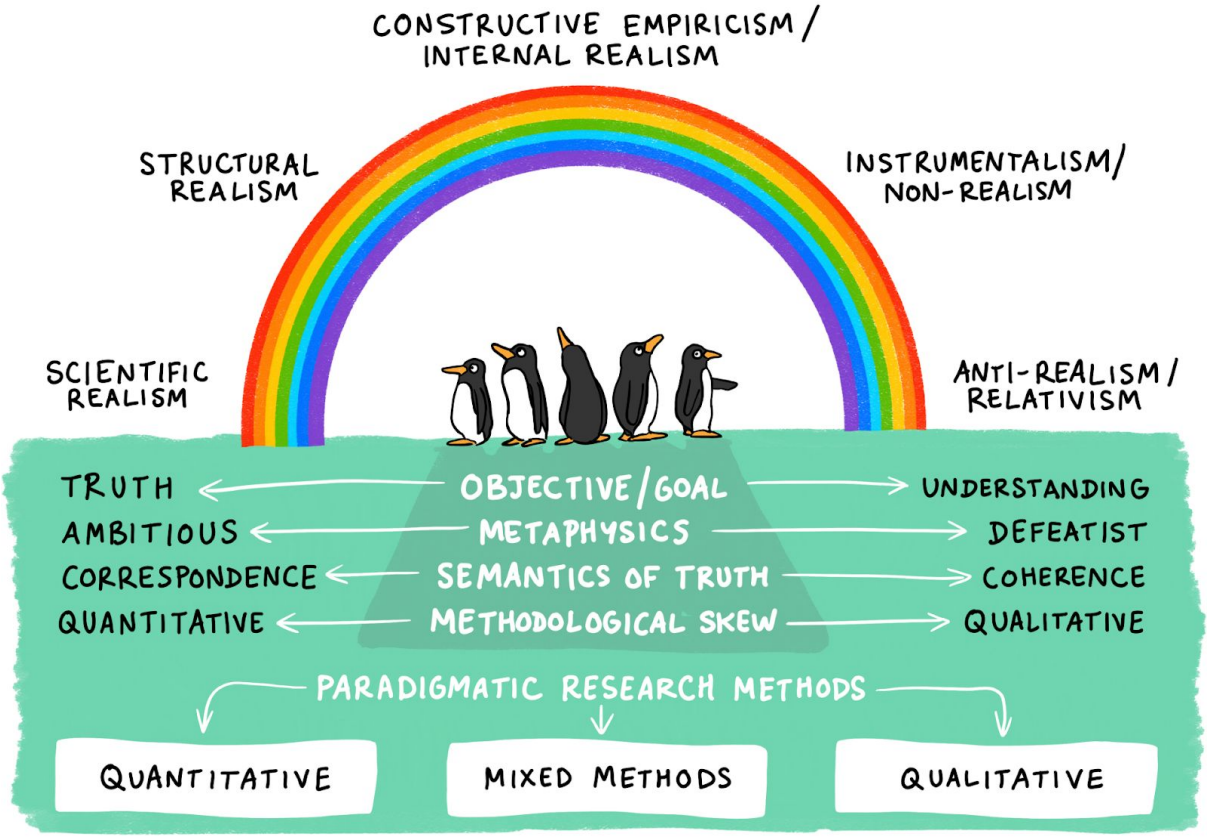
Pragmatism

> "Essentially, all models are wrong but some are useful." (Box, 1976)

Pragmatism suspends questions of the final 'truth' of research outcomes and focuses only on their usefulness for a particular end. Pragmatists often make use of mixed methods and typically vary their approach depending on the constraints of a particular project. This can be quite effective for smaller or time-pressured research projects and avoids getting bogged down in philosophical issues and academic debates, but perhaps is of limited use in a doctoral project where the goal is usually to take the time needed to create new knowledge. On the other hand, doctoral projects are time-bound and moving in the direction of Pragmatism can be a route to successfully completing a project.

The crucial consideration for the Pragmatist is whether the outcomes of research have any application value rather than whether they are "true". There are no distinctively pragmatic research methods since this approach is about making judicious use of the others. Pragmatic approaches may be less likely to prioritise ontological, epistemological or axiological consistency when combining different research methods, but the emphasis is on solving a pressing problem and adapting to the limitations of a project.

Each of these paradigmatic approaches is associated with methods that reflect their philosophical commitments, but the most important methodological difference is perhaps between Positivist and Interpretivist worldviews. Other paradigms typically make use of these approaches but with a distinctive slant. The following diagram shows how research approaches map onto philosophical worldviews.



Causal Comparative (Explain variation, regression based)
Correlation Based (Relation between variables)
Data Mining & Analytics
Experimental & Non-experimental
Longitudinal Analysis
Meta-Analysis
Random Controlled Trials
Quasi-experimental
Survey

Convergent Parallel
Embedded Design
Explanatory Sequential
Exploratory Sequential
Interdisciplinary
Multidisciplinary
Multiphase
Transformative Mixed Methods
Survey

Action Research
Case Study
Cognitive Interviews
Content Analysis
Design-Based Research
Ethnography
Grounded Theory
Historical
Iterative Design
Meta-synthesis
Narrative
Phenomenology
Survey

Figure 3. The Spectrum of Research Approaches and Paradigmatic Research Methods

Moving from a research paradigm to a specific research design can be a challenging process. In practice, research projects will often involve striking a balance between different elements of data collection and synthesis. It's also important to ensure that the approach taken reflects the research question.

See Ryan (2018) and Pham (2018) for more on the advantages and disadvantages of different paradigms.

Multidisciplinarity, Interdisciplinarity, Transdisciplinarity

Increasingly, research takes place across traditional disciplinary boundaries. This can be a collaboration between people from different subject backgrounds, or one researcher might combine approaches based on the research question(s) they are attempting to answer.

This kind of research presents its own challenges, especially for the solo researcher. Disciplines define themselves by their epistemological foundations, so it's easier to combine approaches with similar epistemologies. The further apart the assumptions of the disciplines, the harder it would seem to be to combine them. But there are options here.

As Choi & Pak (2006) note, the terms multi-, inter- and trans- disciplinarity are often used interchangeably, partly because they are often ambiguously defined. They propose the following schema:

- Multidisciplinary research draws on several disciplines in parallel but they remain separate from each other
- Interdisciplinary research synthesizes approaches from different disciplines into a new and coherent whole
- Transdisciplinary research integrates and transcends disciplinary boundaries, bridging humanities and sciences

Obviously the specific combination of approaches used will require some thinking about research design. So why bother? The appeal of these combinations is that they allow for new and innovative ways of approaching research questions, so much so that entirely new subject areas are created. This can often result from the application of digital technology (as in the case of digital humanities) but more often is used to address a 'grand challenge' from several vectors at the same time. Using a well-established research method can minimise the methodological complication of a project, but you might want to use several methods to approach a research question from several angles at once, particularly if you are seeking a unique angle for doctoral research

von Wehrden et al. (2019) identify five basic units that can help to guide interdisciplinary and transdisciplinary research.

1. Creation of collective glossaries
2. Definition of boundary objects
3. Use of combined problem- and solution-oriented approaches
4. Inclusion of a facilitator of inter-and transdisciplinary research within the research team
5. Promotion of reflexivity by accompanying research

Mixed Methods & Triangulation

Combining research methods is characteristic of the approaches taken by multidisciplinary, interdisciplinary and transdisciplinary researchers. But it is also commonly found in disciplinary research. "Mixed methods" is used to describe research that combines qualitative and quantitative data in a single study. This is often done to recognise and try to overcome the limitations of different approaches, but when it comes to assembling the data into a whole (known as "triangulating") great care must be taken to ensure that the resulting claims made are supported. (See also the description of Mixed Method Research on p.50 below.)

See Creswell (2009; 2013) for a popular and accessible description of how to approach mixed method research design.

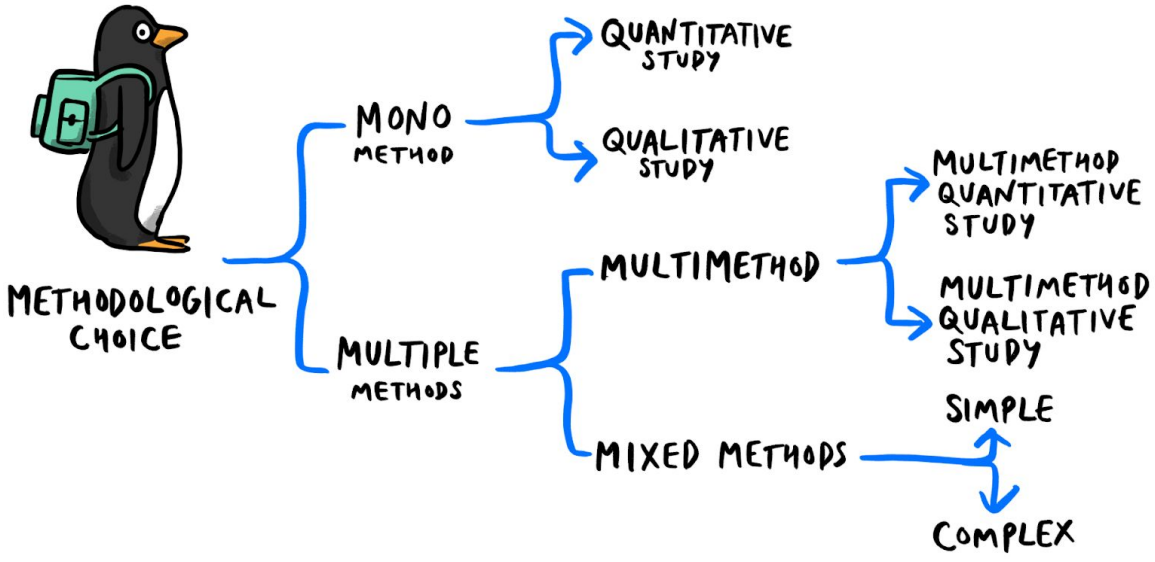


Figure 4. Mono and Multiple Method Research Design (based on Saunders et al., 2009:152)

Researching Open

So far we have discussed the foundations of research and different methodological approaches in a quite general sense. If you're interested in researching aspects of open education – such as open educational resources (OER) or open educational practices (OEP) – are there certain methods that are preferable? It's possible to get a sense of this from looking briefly at the history of research in open education and understanding what has been impactful.

Open Research Cycles

If we view a typical research lifecycle as follows:

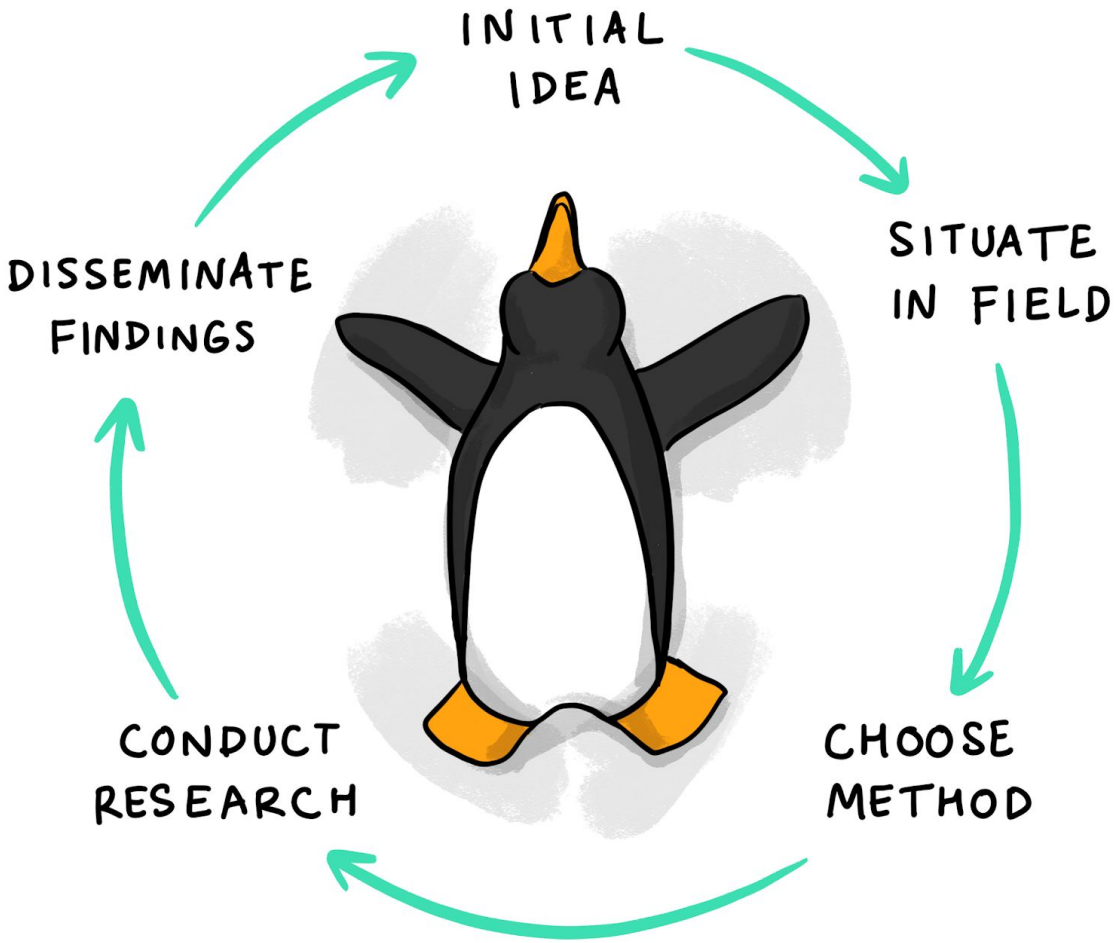


Figure 5. The Research Lifecycle

For each of these stages, open practice can be seen to offer alternatives or opportunities to enhance the phase. Taking each in turn we can examine some examples.

Devise idea

Use of blogs, social media etc can be useful to test out ideas and get early feedback. Also can conduct lightweight pilot studies, surveys and find possible collaborations. We developed an Open research agenda through this method.

Situate in field

Open access has been one of the great successes of open research, it means researchers can have access to literature you might not otherwise. Use of open data can also be useful to test viability. A search through openly available research bids can be productive.

Choose appropriate method

New methods based on open approaches are available such as crowdsourcing, data visualisation, or network analysis. There may be different ways to approach the problem than the traditional ones. For example, Weller et al. (2018) used citation analysis to produce an Open Education Guide. Creswell (2014) provides simple criteria for selecting a research approach, based on problems and questions, research experiences, and audience.

Conduct research

The concept of "guerrilla research" (Weller, 2013) begins from the idea that there is lots of free, open material which means it is possible to conduct "lightweight" research without permission. This is often smaller scale work that can be undertaken by an individual, it effectively condenses the whole research cycle: researcher has the idea, finds open data, undertakes some analysis, then blogs it: all without the need for funding or permission. When doing this kind of research it's important to maintain standards in research ethics.

An open approach which communicates through social media throughout the process can raise profile and lead to collaboration. Katy Jordan's work with MOOC completion rates was done using open data, which she blogged and visualised using open tools. This was picked up in the USA and led to an invite from Gates Foundation to bid for further work (Jordan, 2017).

Disseminate

Disseminating work via open access brings greater visibility, citations and downloads "open access citation advantage". But beyond this there are other approaches to dissemination, including blogs, social media and video to get across messages. Development of other outputs beyond the traditional papers, such as infographics, MOOCs, and open tools. The Open Education Research Hub developed an Open Researcher Pack and Open Researcher Handbook as an output to be used by open researchers to increase capacity.

- Farrow, R., Perryman, L.-A., de los Arcos, B., Weller, M. & Pitt, R. (2016). OER Hub Researcher Pack – a toolkit for open education researchers. Open Education Research Hub. https://oerhub.pressbooks.com/
- Pitt, R. de los Arcos, B. Farrow, R. and Weller, M. (2016). Open Research. Open Education Research Hub. http://oro.open.ac.uk/48035

Arguably open education research has reached a phase of maturity. In recent years we have seen examples which support the idea that open education research is being recognized as a field in itself.

Open Practices

Open practice is also an emerging field. One characteristic feature of open researchers is that they often integrate open elements into what they do. This can include things like:

- Agile project management
- Directly influencing practice
- Radical transparency
- Social media presence, blogging
- Using networks as a research resource
- Sharing research instruments
- Open access publication

It's for individual researchers to decide the extent to which they make their practice open, but many find that open practices improve the efficiency, reach and impact of their work.

Weller (2011) proposed a schema for an open, networked research cycle as follows:

Planning

The researcher establishes their research question through iterative exposure, using social networks, and blogs. They seek feedback and ask for relevant experience. Using online information sources such as delicious feeds and Google scholar they gather relevant information to inform their research proposal. They set up a series of Google alerts around a number of subjects to gather daily information. A plan is created that incorporates regular release and small scale outputs. They hold an informal online meeting with some interested parties and establish a project blog or wiki.

Collecting data

The researcher continues to use online information sources for their literature review. They create an online database and seek user contributions, seeded by requested contributions from peers in their network. An online survey is created in SurveyMonkey.

Analysing

The researcher uses Google analytics to examine traffic data, and SurveyMonkey analytics to analyse responses. They use data visualisation tools such as ManyEyes to draw out key themes in responses.

Reflecting

Reflection occurs throughout the process by means of a series of blog posts and video interviews.

Designing a Research Project

In this part we describe the process of moving from a research question to selecting a research paradigm and generating a process for conducting a research project.

Planning Research

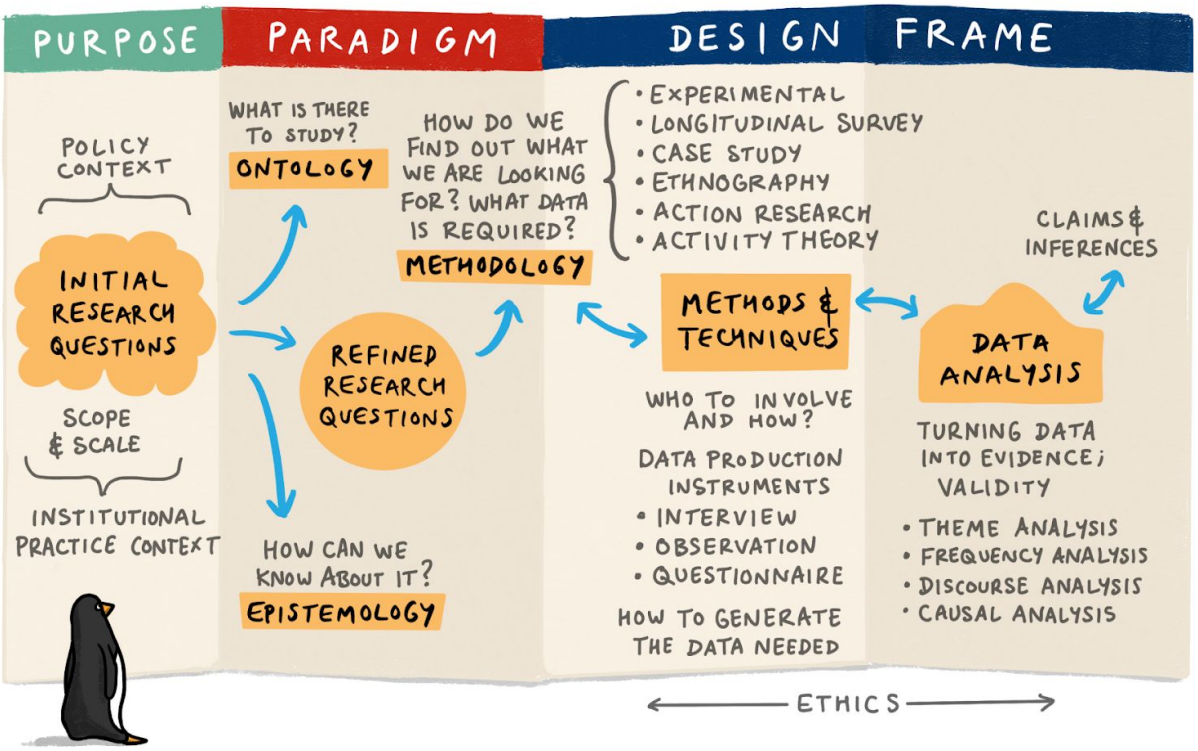


Figure 6. The Research Design Process

This diagram (taken from an archived Open University (UK) course entitled E891 Educational Inquiry) shows one way to schematise the research design process. Here, one begins with a research question and a context for the research (comprising policy and practice). This informs the potential scope and scale of the project. The next element is to consider the paradigmatic research approach that will be used, thinking about the ontological and epistemological elements. The approach taken will often reflect the nature of the research question; the kind of data it is possible to collect; and work previously done in the area under consideration. This is the design phase where most researchers will consult relevant literature and contributions by others.

Once working from a research paradigm it becomes possible to start making concrete choices about method(s). Depending on the project, this will involve choices about things like:

- Who will be involved? How will they be selected/contacted?
- How data will be collected
- How data will be managed and stored securely
- Designing, producing and piloting research instruments
- Determining the basis of rigour in the study and the "trustworthiness" (credibility, transferability, dependability, and confirmability) of the data (Guba, 1981; Shento, 2004)
- Ensuring ethical good practice is built into the project (see below)
- Setting a plan for data analysis

The data collection phase can begin once these decisions are made. It can be very tempting to start collecting data as soon as possible in the research process as this gives a sense of progress. However, it is usually worth getting things exactly right before collecting data as an error found in your approach further down the line can be harder to correct or recalibrate around.

From here, things become a bit less generic as the specifics of data collection and analysis are going to be determined by the research methods being used. There are additional aspects which it is worth considering in detail at the research design stage.

Ethical Issues

If you are doing research within an institution there will be regulations and guidelines to follow to ensure that your work meets required ethical standards. The standards are usually set by a local body (e.g. an ethics committee or Institutional Review Board) to meet generally accepted guidelines. Conforming to their guidelines is usually an institutional requirement, but it is also good practice. Even if you are doing research without an institutional affiliation it's a good idea to meet these standards. For instance, CITI certification is a USA standard for conducting human subject research: (https://about.citiprogram.org/en/homepage/).

Since it can take several months to get formal ethical approval for a project, it's essential to start the process as soon as possible so this does not impact on your data collection schedule. Auditing the ethical aspects of a project can also be a

useful way of refining your research and anticipating issues that could arise downstream.

- See Farrow (2016) for an overview of research ethics in open education
- Consider taking the research ethics training offered by your local institution, or by the National Institutes of Health (USA) https://ethics.od.nih.gov/training.htm

You can also approach members of the GO-GN team and wider network for advice on dealing with ethical issues or other matters that arise.

Managing Risk

Risk is part of all kinds of activities. Doing research carries risks characteristic of all projects which require adequate time, money and quality in the final product. Some of these overlap with ethical issues, such as ensuring that people who participate in your research aren't exposed to unnecessary harm and ensuring that consent is informed. These are usually addressed when writing the protocols for a study and included in IRB or ethics committee applications, who will often want to see an ethics plan and copies of the proposed research instruments.

Ethical considerations are foregrounded since minimising the risk to people is the most important mitigation. Aside from these, there are interrelated operational issues to consider throughout the research lifecycle.

- Costs: For a lot of doctoral researchers making sure they have adequate funding throughout can be a challenge. This can be a matter of a grant not covering all of the activities required for a project; or can result from overrunning in time. Failure to correctly estimate costs when you start a project can lead to problems downstream. Managing the financial aspects is a key element in successful projects.
- Time: It's common for people writing PhDs or EdDs to feel the pressure of time, especially if they have to balance their studies alongside personal and professional commitments. Doctoral study also involves more self-regulation than other degrees. Managing your time and finding ways of being productive when you need to are important skills for researchers.
- Scope: Doctoral projects can start with a well defined research question but, as the literature is reviewed, the essence of the project begins to evolve. This is no bad thing as it shows that the ideas and concepts are being developed, but if the definition of the project starts to change then care must be taken to ensure that it can still be delivered with the resources available.

- Quality: Quality refers to the standard of the work being delivered, and is to some extent dependent on the other factors. At a practical level, the most important quality consideration is convincing your examiners that you meet your institutional requirements for the award of a doctorate.

At its most general level, risk management is about anticipating problems before they arise and adapting to unforeseen situations. What happens if things don't go as anticipated? You might lose access to a data source that you were relying on. Do you have a plan B? Plan C? What happens if you fall ill and are unable to work on your project? When focused on the academic parts of a project it can be easy to overlook these kinds of considerations.

Ideas for risk mitigation:

- A better research design can mitigate more risk, or build in more contingency.
- Practising agile approaches develops the ability to adapt to changing circumstances while maintaining overall vision.
- Writing a log of risks and their mitigation as a project is underway to record further issues that arise so you can get better at anticipating and solving problems.

Using Technologies

Many modern research techniques use specific software programs to support the process of analysis. Some of these are listed in the table below along with examples of software commonly used in different parts of the research cycle.

This table is intended to be illustrative, not exhaustive or exemplary. There are many hundreds of software options available to researchers, and different packages can appeal for different reasons (such as licensing, relevant to task, user interface, versatility, etc.)

Purpose	Categories	Examples
Search & Discovery	Search Engines	Duck Duck Go Firefox Google Google Scholar Alerts Internet Explorer RSS
	Bibliographic Search	Google Scholar Subject-specific databases (e.g. EBSCO, JSTOR, etc.)
Data Collection		Google Forms SurveyMonkey
Data Analysis	Statistical	Microsoft Excel SPSS Stata R
	Qualitative Data Analysis (CAQDAS)	ATLAS.ti Coding Analysis Toolkit (CAT) Dedoose MAXQDA NVivo qcoder
Data Visualization		Blender Datawrapper QGIS Shiny Tableau
Reference Management		Endnote Mendeley RefWorks Zotero
Manuscript Preparation	Word processor	Google Docs LateX Libre Office Microsoft Word OpenOffice
Dissemination	Academic Social Networks	Academia.edu Google Scholar Mendeley ResearchGate
	Presentations	Google Slides Microsoft PowerPoint Prezi

Figure 7. Examples of software used in parts of the research lifecycle

Having to learn how to use new software can be intimidating, and time may need to be set aside for this. Sometimes it's worth undertaking some formal training in the use of software (particularly for data analysis). Effective technology enhanced workflows can make research more efficient as well as enhancing the agency and reach of the researcher.

Self Management

Doctoral study is unlike other degrees in terms of expecting candidates to display a very high level of self-organisation and self-management. It can take a while to settle into different ways of working, especially if things don't go according to plan right away. When planning research, don't expect superhuman things of yourself and ensure that you practice self-care by factoring in time for breaks and contingencies. It's a good idea not to underestimate the time it will take to do things to a high level of quality.

Getting the most out of yourself and staying on top of your project is a challenge in its own right. It can be helpful to regularly take stock of what has been achieved so far, reflecting on what could work better.

It's also important to plan for your own professional development throughout the life of your doctoral studies. Will you need to learn new skills (or brush up old ones)? Institutions often have a budget to support this but places on training programmes can be limited.

Another thing to think about is developing your personal networks, particularly if your research is dependent on them. Networks like GO-GN can be a valuable source of support throughout a Ph.D or Ed.D.

Research Design

By this point we hope you have a sense of how research methods can take us on a journey, working from ideas and philosophical speculation to a specific set of actions that can generate new knowledge. All of these elements need to inform the design of research. It's often helpful to keep in mind the ultimate goal of your project so you can design your specific activity around reaching this point.

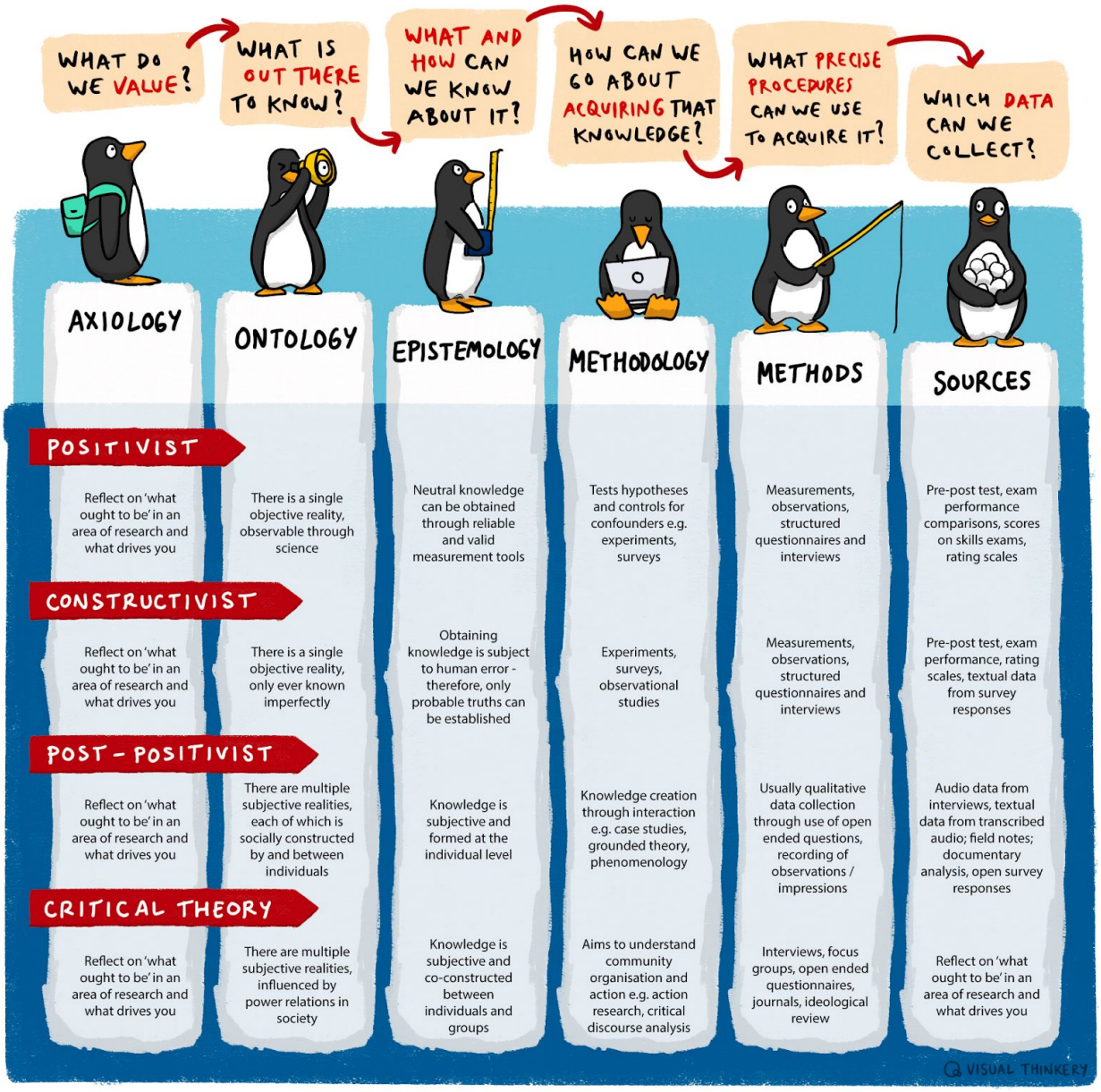


Figure 8. Progression through the Research Process (based on Brown & Dueñas, 2020)

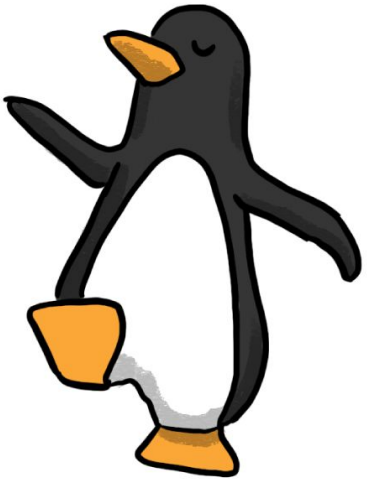
For more on the research design process, see the following: Ajzen (1991); Akkerman & Bakker (2011); Anderson (2013); Armellini & Nie (2013); Bloor & Wood (2006); Brown & Wyatt (2010); Casadeval & Fang (2016); Clements & Pawlowski (2012); Conole (2013); Cox, & Trotter (2017); Crotty (1998); Davis & Sumara (2006); Design Thinking for Educators (2013); Denzin (2017); Gray (2014); Guskey (2002); Kivuna & Kuyini (2017); Lefever, Dal & Matthíasdóttir (2007); Leong & Austin (2006); Manen (2018); Maxwell (2004); Maxwell (2012); Maxwell (2013); McKenney & Reeves (2012); Miles & Huberman (1999); Mills, Van de Bunt, & De Bruijn (2006); Munafò et al., (2017); Patterson & Williams (1998); Quiñones, Supervielle & Acosta (2017); Vansteenkiste, Lens, & Deci (2006); Wenger-Trayner (2013).

Research Method Insights from the Global OER Graduate Network

So far we have discussed methods in research in quite general terms. In this section you can find short descriptions of specific research methods along with insider tips on their use from GO-GN researchers who have used them in their doctoral research. You can use these as a starting point for thinking about your own research approach.

Action Research and Participatory Action Research

Action research is a form of self-reflective inquiry undertaken by participants in social situations to improve the rationality and justification of their practices, their understanding of these practices, and the conditions in which the practices are carried out. In the context of educational research this can involve practicing educators to the process of conducting classroom-based action research (Mertler, 2014).



It is an approach in which the action researcher and participants collaborate in the identification of the problem and co-designing the solution based on the diagnosis. Characteristically, action research relates to collaboration between researchers and stakeholders to solve organisational problems (Whyte et al., 1991).

In action research the researchers co-learns with a stakeholder group. In participatory action research they take a more active role as a member of a community. Participatory action research is sometimes used when an organisation needs to solve a problem but no clear line of inquiry is indicated. Alongside this kind of flexibility, another advantage of these approaches is that research can be tailored to a specific context while focusing stakeholders, allowing unanticipated solutions to emerge. This might be done to personalise a learning experience, or promote social inclusion (Warschauer, 2003; Lewis & Sanderson, 2011; Kemmis et al. 2013). Conversely, this approach might be considered disadvantageous because it may limit the ability to make generalised claims or apply what has been found in new contexts.

Action Research: GO-GN Insights

Ada Czerwonogora used Action Research as part of a complex case study into reflective practice and the transformation of teaching through technological integration on behalf of the PRAXIS project:

> *"The project approach was based on Open Science and Open Educational Practices as foundational frameworks to face the challenges of critical Educational Action Research... I see as an advantage the multi-methods approach, to provide a deep understanding of the complex case. However, this could result in a more difficult methodology… I think the pros are far more than the cons."*

Jenni Hayman used an action research approach in face-to-face workshops and on a MOOCs to determine the usefulness of an awareness and support strategy designed to increase the use of OER among post-secondary educators:

> *"The method for my research was mixed method action research (MMAR) and it was defined by my institution as a requirement...I engaged in three cycles of research (a common practice for action research), each leading to more refined practices and greater participation. Although my personal tendency is toward qualitative methods, I found the requirement of a mixed method approach for my research extremely beneficial as a novice. I was required to learn and practice skills of both approaches and to learn how different types of data interact and combine to magnify insight. When qualitative and quantitative data agreed, this generated confidence for me that I was on the right path. When these data disagreed, I returned to the literature, and method descriptions to develop explanations and further refine my contexts and the contexts of my participants. Action research (similar to design based research) is grounded in practice and the design of experiences. It is personal and contextual and is therefore impossible to describe as objective or replicable. It is often used by educators to examine and improve some element of their teaching practice or the systems in which they work."*

Francisco Iniesto used action research within a Person-Centred Planning (PCP) perspective, designed to empower disabled learners to make their own choices and decisions by placing the individual at the centre of the planning process for improving accessibility in MOOCs:

> *"Learners were a useful source of data to explore the accessibility barriers and their solutions in using the technology and the learning designs they come up against when interacting with MOOCs. The data from the interviews helped to understand their motivations, the current accessibility barriers they*

> *have found, how they reacted to them, and their suggestions for desired solutions".*

Useful references for Action Research: Caruth (2018); Danermark et al. (2002); Freire (1994); Heron & Reason (1997); Ivankova (2015); Kemmis, McTaggart & Nixon (2013); Lewis & Sanderson (2011); Mertler (2014); Smith (1999). Warschauer (2003); Whyte, Greenwood & Lazes (1991)

Case Study

A Case Study is a research method involving a detailed examination and in-depth description of a particular empirical case. This can be done in many different ways, and the unit of analysis can vary (a person, an institution, a country, etc.). Case Studies can include both quantitative and qualitative evidence (Stake, 1995) and typically rely on bringing together many different articles of evidence from various sources to illuminate the case as a whole.

Case Studies benefit from having a developed theoretical framework before data collection begins (Yin, 2003). At the same time, the Case Study approach allows flexibility and can be used in exploratory contexts. This can be attractive to the researcher because it allows data collection to begin immediately (though there remains a need to impose a theoretical structure in the analysis phase). Consequently, Case Studies can be conducted at different levels of formality and replicability (Hetherington, 2013).

The case study research design can be used to test whether theories and models work in real contexts of application (Shuttleworth, 2008) and, conversely, to generate hypotheses and theories.

Case Study: GO-GN Insights

Sarah Hutton used a hermeneutic phenomenological case study to illuminate a direct connection between undergraduate student participation in courses with a participatory OER authorship or open access publishing of student artefacts model, to the development of internal goals and deepened engagement:

> *"Participatory OER development and an open pedagogical model provide the potential for students to have autonomous control over the development of course content, fostering greater intrinsic motivation, and therefore more successful and transferable learning outcomes. The resulting analysis creates a compelling case for the adoption of OER materials beyond the affordability argument, further advocating for the engagement of students in open scholarship at the undergraduate level."*

Viviane Vladimirschi explored evidence-based guidelines in the context of Teacher Professional Development (TPD) for Brazilian fundamental education public school teachers by undertaking an intervention in one school. The main goal of the OER Development Program was to raise awareness and build teachers' knowledge regarding OER adoption and use:

> *"The case study methodology used in this research is a very common approach within Educational Studies. It is also a fairly easy method to use and the analysis of multiple sources of data have the potential to not only generate new insights throughout the case study but also generate new theory. Theory-building is very well-suited to new research areas, which was the case of this research. However, there are some disadvantages to using this methodology. First, it is not possible to generalize the findings from a single case study. Second, achieving the balance between producing an overly complex theory or a narrow idiosyncratic theory is quite challenging. Theory generated by case studies must be testable, replicable and coherent. The TPD guidelines generated by this research are testable, replicable and pretty straightforward so I am confident I managed to achieve this balance. The Design Thinking for Educators approach (please note that it is not a method) that I used in this research for the face-to-face workshops I highly recommend to any researcher who wishes to undertake an intervention, especially in the K-12 sector. This approach not only enables researchers to gain more insight into potential solutions for introducing new professional practices, but also affords teachers multiple opportunities to participate in the process of determining how innovation may be best implemented. Its only potential disadvantage is that it requires a longer period of time of application during each of its distinct phases to obtain bottom-up buy-in to an innovation."*

Useful references for Case Studies: Hetherington (2013); Shuttleworth (2008); Stake (1995); Yin (2003)

Content Analysis and Thematic Analysis

Content analysis is a research method for studying documents - broadly construed - and including formats such as texts, interview transcripts, images, audio or video (Bryman, 2011). In an educational context, Content Analysis can be used to systematically examine patterns in communication and discourse. This is done through a systematic reading or analysis of "texts" which are assigned codes to indicate the presence and proportion of meaningful content (Kimberly & Neuendorf, 2016).

Content analysis uses a descriptive approach in both coding of the data and its interpretation of quantitative counts of the codes. Thematic analysis is usually applied to a set of texts where the researcher closely examines the data to identify common themes, ideas and patterns of meaning that come up repeatedly (Clarke, Braun & Hayfield, 2015)., Thematic analysis provides a purely qualitative, detailed, and nuanced account of data (Vaismoradi, Turunen, & Bondas, 2013).

Content Analysis allows the analysis of social phenomena in a non-invasive manner. It is possible to analyse patterns of content using both quantitative and qualitative methods, systematically labelling the content (Finfgeld-Connett, 2014). Thematic analysis also provides a systematic and rigorous approach to theme development with well defined stages (Braun & Clarke, 2006).

Content Analysis: GO-GN Insights

Johanna Funk used Content Analysis and a rigorous cycle of 'filtering' the resources with three sets of criteria (shared stakeholder perspectives; decolonising principles; evaluation framework criteria):

> *"I questioned the extent of the openness to the cultural backgrounds and frameworks that the open and digital media could facilitate; what could educational institutions do to be more functional, culturally responsible and responsive for marginalized populations and knowledge subsystems such as Aboriginal and Torres Strait islander communities. Based on the cycles of evaluation, I found principles of best practice according to three sets of criteria I worked with".*

Useful references for Content/Thematic Analysis: Clarke, Braun & Hayfield (2015); Braun & Clarke (2006); Bryman (2011); Heath, Hindmarsh & Luff, (2010); Kimberly & Neuendorf, 2016; Finfgeld-Connett (2014); Saldaña (2016); Vaismoradi, Turunen, & Bondas, 2013).

Design-Based Research and Interventions

Design-Based Research (DBR) is a research methodology used by researchers in the learning sciences. DBR is a concentrated, collaborative and participatory approach to educational inquiry. The basic process of DBR involves developing solutions or interventions to problems (Anderson & Shattuck, 2012). An "Intervention" is any interference that would modify a process or situation. Interventions are thus

intentionally implemented change strategies (Sundell & Olsson, 2017). Data analysis takes the form of iterative comparisons. The purpose of this research perspective is to generate new theories and frameworks for conceptualising learning and instruction.

One positive aspect of DBR is that it can be employed to bring researchers and practitioners together to design context-based solutions to educational problems, which have deep-rooted meaning for practitioners about the relationship between educational theory and practice. DBR assumes a timeframe which allows for several rounds of review and iteration. It might be seen as a long-term and intensive approach to educational inquiry which is not really suitable for doctoral work, but increasingly there are examples of this approach being used (Goff & Getenet, 2017).

DBR provides a significant methodological approach for understanding and addressing problems of practice, particularly in the educational context, where a long criticism of educational research is that it is often divorced from the reality of the everyday (Design-Based Research Collective, 2003). DBR is about balancing practice and theory, meaning the researcher must act both as a practitioner and a researcher. DBR allows the collection of data in multiple ways and encourages the development of meaningful relationships with the data and the participants. DBR can also be used as a practical way to engage with real-life issues in education.

DBR & Interventions: GO-GN Insights

Roberts (2019) used a design-based research (DBR) approach to examine how secondary students expanded their learning from formal to informal learning environments using the open learning design intervention (OLDI) framework to support the development of open educational practices (OEP).

> *"We took some methods and research classes in my EdD program. I took Design-based research (DBR) and found it confusing and overwhelming. As such, I decided to take an extra course on case study research because it seemed to speak to me the most. In my mind I thought I could compare and contrast a variety of secondary school teachers integrating open ed practices. Through my initial exploration, I discovered that in my school district (30,000 + students), there are many teachers using OEP, but they were not interested in working "with" me, they wanted me to watch and observe them teach - then write about it. I began to understand that not only did I want to consider focusing my research on an emerging pedagogy (OEP) I also realized that I wanted to consider newer participatory methods. I did not think of DBR in this context when I took the initial course.*

> *"I knew I wanted to work with a teacher and complete some kind of intervention in order to support them in thinking about and actually integrating OEP. DBR was suggested to me multiple times, but I kept pushing it away. At the same time many of my supervisory committee and my peers did not think I should even consider DBR. I discovered that many researchers don't know about it and are fearful of it. As I learned, when you do choose DBR, it is kind of like being an open learner in that you believe in the philosophy behind the DBR process. You just "are" a DBR researcher and educator.*
>
> *"It took many hours of reflection, reading about different examples of DBR, going to workshops and webinars about DBR in order to really see the possible benefits of DBR (collaborative, iterative, responsive, flexibility, balance between theory/ practice and relationships based) to get me to take the plunge..." (Verena Roberts)*

Useful references for Design-Based Research: Anderson & Shattuck (2012); Design-Based Research Collective (2003); Goff & Getenet (2017); Sundell & Olsson (2017)

Discourse Analysis

Discourse analysis is a qualitative analysis approach for studying language about its social context. It aims to understand how language is used in real-life situations. Discourse analysis investigates the purposes and effects of different types of language, cultural rules and conventions in communication, how values, beliefs and assumptions are communicated and how language use relates to its social, political and historical context (Gee, 2014). Discourse analysis is often associated with critical inquiry approaches and perspectives because analysis of what people can reveal unequal power relations and inequality.

Discourse Analysis: GO-GN Insights

Sarah Lambert analysed 24 key publications of open education to understand the gap between rhetoric and reality in educational outcomes relating to the promise of OER to make changes to educational access patterns (democratising knowledge

etc.) The outcome of the analysis was the creation of a new definition of open education.

> *"Motivated by the desire to understand and account for the failure of MOOCs to widen participation in education despite the early promise of addressing global educational inequality, this thesis investigates alternative models of recent open online education program design and delivery that are more successful at enabling socio-economically disadvantaged learners. Social justice improves on current ill-defined notions of "openness" as the driver for more equitable forms of education. Secondly, recognitive justice is needed to correct gender and racial stereotypes and discrimination through recognising difference as valuable. Third, representational justice extends the rights of recognition to the right to have a voice to represent oneself in public and political debate, and to therefore be in a position to influence decisions effecting one's life"*

Useful references for Discourse Analysis: Gee (2011); Gee (2014); Gee, Michaels & O'Connor (2017); Johnstone (2018); Lambert (2020); Rau, Elliker & Coetzee (2018)

Ethnography

Ethnography is an explanatory account of life experiences in a social system based on detailed observations of what people do and express (Marcus, 1995). Ethnography aims to study social and cultural aspects of a society and the researcher focuses to collect information for that. It focuses on behaviour of people with respect to the social setup they live in. This approach is highly immersive and provides one with a highly transparent and original account of information allowing the culture to speak for itself (Khan, 2018). The behaviour of the participants in each social situation is examined along with the group members' interpretation of such behaviour (Wolff, 2015). Ethnography uses both qualitative and quantitative research methods when studying specific groups that form a part of a larger complex society (Falzon, 2005).

Ethnography: GO-GN Insights

Chtena (2019) has developed a multi-sited ethnographic design including interviews, observations and a system analysis approach to track the development and implementation of open textbooks in Californian higher education. What makes multi-sited ethnography attractive is the prospect of systematically linking observations seemingly distant geographical, institutional, organisational, cultural, technological and cognitive settings. In this case, multi-sited ethnography does not set out from a particular site, but rather from the construction of specific social

practices and phenomena within a relational network that connects several places (e.g., institutions, people, objects, projects and discourses).

> *"The study demonstrates that binary conceptualizations of openness (i.e., "open" vs "closed") based on formal characteristics (e.g., licensing) are not reflective of how people "do" openness in practice, and that different needs, values, priorities and interpretations of "open" give rise to different artifacts in different disciplines and institutional settings. Moreover, the study shows how the frictions of open textbook production, circulation, and maintenance belie the fantasy of open textbooks as a dynamic interface prime for adaptation, modification and remix. What makes multi-sited ethnography attractive is the prospect of systematically linking observations from seemingly distant geographical, institutional, organizational, cultural, technological and cognitive settings. The promise of multi-sited ethnography is, far beyond the simple multiplication of field-sites, a new way of describing systemic relationships and the interdependency of the many 'parts and subparts' of the sociotechnical infrastructure in which technology, such as open textbooks, is embedded. A concern with multi-sitedness, on the other hand, is that by spreading the ethnographer too thinly across space, it jeopardizes anthropology's commitment to depth and thick description. If, especially, the overall duration of the fieldwork remains the same as in single-sited research, it will only be possible to visit and investigate each site comparatively briefly, and build relatively superficial relationships with key informants. Thus, one of the key strengths of ethnography is in danger of being lost. While this is an important corrective, I believe that, in the context of this study, the benefits of multi-sitedness outweigh the potential disadvantages. Since I followed the movement of content and ideas through the open textbook ecosystem, a systemic, multi-locale, multi-entity and multi-platform approach is fitting.*

> *"My advice for anyone interested in multi-sited ethnography is to make sure they have a really good grasp of ethnographic methods, as well as systems theory. It is a lot harder, in many ways, than single-sited ethnography -- harder to plan and harder to execute, so be strategic and be prepared to get outside your comfort zone. I wouldn't recommend this method to anyone who's trying to finish their project in a very short amount of time. I also believe that it necessitates a highly interdisciplinary outlook and training.*

Walter Butler used Netnography (online Ethnography) to support research into virtual communities of practice and provide a framework to guide the research through various stages. It also supports the utilisation of further complementary methods (including interviews and content analysis) throughout.

> *"Using Netnography holds several advantages for my research project specifically: it supports research online and provides a framework to work within guiding the research through various stages. It also supports the utilization of different methods throughout its stages. But it is a younger methodology, which may be disadvantageous to some. I am also applying a two-stage, sequential design. I feel that this approach allows me to address the research questions in a more strategic manner, and it also provides me with a pacing-structure to the research (ie: let's figure this out first so that I can begin thinking about this other piece). This may take more time, though, than other processes, and it also leads to some ambiguity; ie: I couldn't give a precise prediction of how many participants I would have for the second stage of the research project, as it was contingent on the findings from the 1st stage. This may be problematic for some."*

Useful references for Ethnography: Angrosino (2007); Falzon (2005); Khan (2018); Marcus (1995); Marcus (1999); Williams et al. (2014); Wolff (2015).

Evaluation Research

Evaluation research can be defined as a type of study that uses standard social research methods specifically for evaluative purposes, perhaps to assess the results of an intervention. Did the intervention meet its goal? Were there any unanticipated consequences? Some research methods are designed to be used as evaluation tools and employ dedicated techniques to this end. These include input measurement; performance measurement; impact assessment; service quality assessment; process evaluation; benchmarking; standards; quantitative methods; qualitative methods and methods drawn from Human-Computer Interaction (Powell, 2006).

Evaluation: GO-GN Insights

Johanna Funk performed a developmental evaluation of 4 research projects that created learning resources. These learning outsources were all in one way 'open' and online.

> *"I think it was so highly reflexive that it could be interpreted as circular; so a disadvantage was the cycles and circles of evaluation; I was answering the research questions each time with the criteria set filters; this resulted in me writing a LOT about what the resources did according to the three set of criteria; in three cycles of evaluation and interrogation. Pedantic is the word I would use. It did have a feel of luxury to*

it, though; being able to really concentrate on the processes in the resources down to a granular level, to see it from a number of perspectives and try to get right down to the mechanisms that helped make the resources different and more collaborative. This 'search for the things' was a bit circular and I had to find the things that we also not collaborative; that's the thing about looking for best practice; you also have to compare it to what's 'not good' in the resource but also know that there are relativity issue with what 'good' means, and to whom. So having a bird's eye view on who the stakeholders are is helpful; as 'knowledge management tools,' learning resources have agenda-pushing potential we might not recognize."

Francisco Iniesto devised an accessibility audit and then used it to evaluate the current accessibility of MOOCs from 4 major platforms: FutureLearn, edX, Coursera and Canvas. This evaluation comprised 4 components: technical accessibility, user experience (UX), quality and learning design; 10 experts were involved in its design and validation.

"The combination of qualitative studies through interviews with MOOC providers and learners and the quantitative information provided by the MOOC survey data has provided an in-depth and multi-faceted insight into accessibility needs of MOOC learners. The MOOC accessibility audit has helped to identify accessibility barriers and the audit provides a tool that can be used and iteratively developed further to support the design and evaluation of MOOCs for accessibility. Interviews have involved MOOC providers and MOOC researchers. The aim was to explore the perspectives of platform and course developers on the importance of accessibility of the MOOC environment. The data from this study was useful to understand how to approach the next steps in this research. Interviewing individuals involved in MOOC development helped to understand how they cater for disabled learners, and the approaches they use to design accessible MOOCs. Additional evaluation involved disabled learners who had participated in learning via MOOCs. Learners were a useful source of data to explore the accessibility barriers and their solutions in using the technology and the learning designs they come up against when interacting with MOOCs. The data from the interviews helped to understand their motivations, the current accessibility barriers they have found, how they reacted to them, and their suggestions for desired solutions. Qualitative methods can help to explore a new area of research, the use of surveys in my cases helped to identify students to be interviewed to develop an understanding of their perspective on MOOCs."

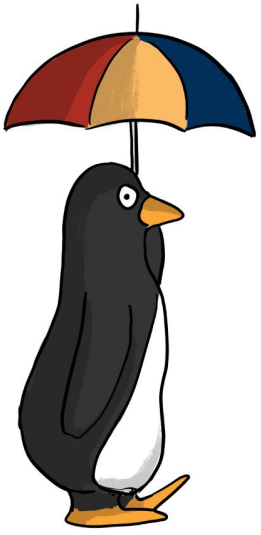
Useful references for Evaluation Research: Chang & Little (2018); Patton (2010); Powell (2006); Rutman (1977)

Experimental and Quasi-experimental Research

Experimental and quasi-experimental research are methods where one or more independent variables are manipulated and applied to one or more dependent variables to measure their effect on the latter. The impact of the independent variables on the dependent variables is usually observed and recorded over time. The experimental research is based on the comparison between two or more groups with a straightforward logic, which may, however, be challenging to execute (Ross & Morrison, 2004).

Useful references for Experimental and Quasi-experimental Research: Kazdin(2016) Ross & Morrison (2004); Sheremeta (2018)

Grounded Theory



Grounded Theory (originally developed as Constant Comparative Method) is a flexible and systematic approach to data collection and the analysis of data. Grounded theory is a systematic methodology involving the construction of 'concepts' through regular gathering and analysis of data (Charmaz, 2006). Grounded theory is sought to give an account of the meaning that actors give to actions, events and objects, which leads to the reasons for their behaviour.

The main characteristic of grounded theory is its inductive reasoning (Glaser & Strauss, 1967). Grounded theory starts with the collection of qualitative data. As researchers review the data collected, repeated ideas, concepts or elements become apparent, and are tagged with codes which have been extracted from the data. As more data is collected, and re-reviewed, codes can be grouped into concepts, and then into categories. These categories may become the basis for a new theory (Glaser, 2002). Grounded theory is particularly useful for the creation of new theories due to its critical perspective. It requires a significant amount of data and can be criticised due to its subjectivity and open ended and process-oriented perspective ending in a narrative description more than a numerical estimation (Oliver, 2011)

Grounded Theory: GO-GN Insights

Virginia Rodés used a qualitative methodology based on the Grounded Theory (together with the Biographical Method and Digital Ethnography) with twelve subjects, teaching staff of three public universities in three Latin American countries (Uruguay, Costa Rica and Venezuela) to understand the dimensions of the adoption of OER and Repositories of OER (ROER) by Latin American universities.

> *"Grounded theory seeks to give an account of the meaning that actors give to actions, events and objects, which leads to the reasons for their social actions. This through inductive procedures, observing society from within, participating in the construction of categories of understanding both common sense, as members of society, and categories of theoretical understanding, as researchers. What twe incorporate as a problematic object of study and observation are precisely the first level typologies of the social world we are investigating. This means that the categories that the actors use in their current action in the first instance become an object of study and then, a second level observation is done, categorizing the categories that the actors have performed on the first level. The Grounded Theory method moves research and researcher towards the development of theory (Charmaz and Mitchell, 2001). On the contrary, ethnography is based on the development of a complete description of a society or group of people and, therefore, provides the details of their daily lives. As a method, ethnography refers to the ways of studying; Know and inform about the world. According to Charmaz and Mitchell (2001) both grounded theory and ethnography have common roots in the sociology of the Chicago School with its pragmatic philosophical foundations. Since then, Grounded Theory and Ethnography have developed somewhat differently, however these approaches can complement each other.*
>
> *"The Grounded Theory method can expedite fieldwork and move ethnographic research towards theoretical interpretation, while resorting to ethnographic method can prevent studies based on grounded theory from dissolving into "fast and dirty" qualitative research. The biographical methodology gathers people's experience as they process and interpret it. This revelation of facts and interpretations explicitly or implicitly is filtered by the beliefs, attitudes and values of the protagonist. Through the biographical you can know meanings and contexts of meanings of the individual, as part of the social, or social structures and norms. The subject does not speak of the intimate as his sensation, but speaks of his social "I". Our methodological approach also integrates the virtual ethnographic method (Hine, 2000), also called digital ethnographic methods, which make use of Internet and digital technologies for the collection and analysis of research*

> *data. Digital ethnography allows us to take advantage of the potential that technologies are offering to project knowledge about reality in contemporary society in greater depth, both in terms of the definition of the object of knowledge itself and the methodological design to access it. It is in this sense that digital ethnography techniques are incorporated into the design of my research. Within the framework of high technological availability scenarios, methods of the data collection techniques typical of the ethnographic methodology can be expanded to include web conferences, chat, videoconferences, forums, among others. From the use of this type of resources, digital narratives can be obtained, stories by subjects conceived as spokespersons or social representatives of the groups and communities."*

Hélène Pulker followed Constructivist Grounded Theory methods of data collection and analysis to conduct an inductive qualitative study into the impact of reuse and adaptation of OER among language teachers.

> *"Regardless of the chosen method, there are no absolute rules or formula for attending to qualitative data analysis or any ways to replicate perfectly the researcher's analytical thought processes. The available guidelines and suggestions are not rules and therefore each qualitative researcher will have to find their own way through the data. As a result, each qualitative analysis is unique and therefore makes your research original. However, it rely on the researcher's skills, who constantly has to make judgements and exercise creativity while applying the guidelines.*

> *"The analysis depends on the analytical intellect and flair of the researcher and the human factor is the great strength and the fundamental weakness of qualitative enquiry. The great advantage is the flexibility. Throughout my data collection and analysis, I continuously analysed and questioned data through coding, re-coding, comparing codes, and finding sub-categories to arrive at the final analysis. This process allowed me to look for the emergence of unexpected trends and to make connections between the codes. As I observed and questioned the data, it became clear that participants were experiencing OER reuse in different ways. I could identify some similarities across a number of participants and was able to identify three different types of OER users, each having different characteristics. From that point onwards, I was able to explain the categories by comparing data from each type of user's point of view and I arrived at a more comprehensive analysis of the reuse process that emerged from my study. The robustness of the data analysis lies in the cross comparison of categories and types of user, as I explain in my thesis.*

> *"However, the big downside is the complexity of finding your way through the data because there are no preconceived codes or theoretical framework you can rely on. The codes developed in the analysis are largely provisional to start with and very often subject to much change. The principles of interpretative coding are not as straightforward a procedure as I had originally imagined. Coding for meaning is nebulous and has posed challenges. The gradual formation of codes and categories was, in my analysis, rather a tentative process whereby I could see that putting different 'pieces' together would yield different meanings. Thus, my experience was often one of going round and round the data. A further contributory factor to the difficulty in deciding on the label for a code was the absence of an overarching framework for looking at the data. In other words, I did not have an overarching view of which concepts might be included in the schema. I would recommend students who wish to do grounded theory to think about the differences between inductive and deductive analysis and be very sure that they do not want to rely on theoretical framework to start with, because the grounded theory analysis takes a long long time, and when the researcher has possible avenues to explore to start with, it is easier to handle a set of data. I would also recommend the use of a data analysis software, even though the Constructivist grounded theorists advise against this for epistemological reasons."*

Useful references for Grounded Theory: Charmaz (2006); Corbin & Strauss (2015)' Glaser & Strauss (1967); Glaser (2002); James (2013); Oliver (2011)

Interviews & Focus Groups

Interviews are a qualitative research method and typically takes the form of a conversation where questions are asked to elicit information. The interviewer poses questions to the interviewee, in an alternating series of usually brief questions and answers. The questions may be highly structured, open-ended, or somewhere in between the two.

In phenomenological, phenomenographic or ethnographic research, interviews are used to uncover the meanings of central themes in the life world of the subjects from their own point of view (Ayres, 2008). A particular case are focus groups which are specially chosen groups of people whose reactions are studied in guided or open discussions to determine the responses that can be expected from a larger population (David, 1996).

The use of focus groups is intended to collect data through interactive and directed discussions by a researcher. It is a form of qualitative research consisting of a group conversation in which prompts are given to elicit sharing data about their

perceptions, opinions, beliefs, and attitudes. Researchers should select members of the focus group carefully for compelling and authoritative responses (Bloor, 2001). Questions are asked in an interactive group setting where participants are free to talk with other group members. During this process, the researcher either takes notes or records the vital points he or she is getting from the group.

Advantages of the interviews include flexibility to the interviewers; and the ability to collect data about the non-verbal behaviour and spontaneity of the respondent. Advantages in focus groups include the diversity of voices and opinions included in those authoritative responses. Conversely, as with other qualitative methods, there can be issues with replicability. Conducting interview studies can be time-consuming and may provide less anonymity to participants. Care needs to be taken to avoid researcher bias (Bailey, 1994). Member checking (sometimes called participant or respondent validation) is a technique that can improve the reliability of results - see Birt et al. (2016).

Interviews & Focus Groups: GO-GN Insights

Penny Bentley used semi-structured interviews with 20 Australian primary and secondary teachers of STEM subject areas interviews to explore and describe the experience of professional learning through open education (PLOE). Following the removal of transcripts used for the piloting and refinement of interview questions, data analysis and subsequent findings were based on the interviews of 16 teachers.

> *"I chose to explore and describe the different ways professional learning through open education (PLOE) was experienced by Australian teachers of STEM subjects, not to focus on PLOE itself. In doing so I viewed experience as a relationship between teachers and PLOE (non-dualistic ontology) and assumed this relationship was the source of new knowledge (epistemology). I wanted to explore, understand and describe the different ways teachers experienced PLOE, from their perspective. This was an interpretive activity, situating my research in the interpretive paradigm. Also, describing the perspectives of teachers, in terms of what PLOE means to them, was research of a qualitative nature. However, there are a range of methodologies within the interpretive paradigm, such as ethnography, grounded theory, phenomenology and phenomenography.*
>
> *"In order to justify my choice for this study I needed to consider the differences between these methodologies. I was not studying the culture of a group of teachers using the open Web to learn about STEM education (ethnography), although culture may be an aspect of how the phenomenon of PLOE is experienced. Nor was I generating a theory to explain the cause of social processes and interactions when teachers engaged in PLOE*

(grounded theory), although I was interested in understanding and describing the different ways these processes and interactions are experienced. Even though human experience is the focus of phenomenology and phenomenography, it is the phenomenographic focus on variation of experience, rather the focus on essence of experience made by phenomenologists, that made a difference to which methodology and methods I chose."

Marjon Baas conducted interviews in both the first and the fourth study of her research. In the first study, interviews were used to explore teachers' current practices with OER and their need for support. The questions in the interview guide were based on the different layers of the OER Adoption Pyramid. Baas used additional interviews to gain more insights into teachers' perceived value of an OER Community of Practice.

"A mixed method approach was adopted in which a questionnaire was sent out to examine the current state of affairs within the context of my study. Afterwards, interviews were conducted to explore teachers' current practices with OER and their need for support. The instruments were designed based on the different layers of the OER Adoption Pyramid (Cox & Trotter, 2017). We used additional interviews to gain more insights into teachers' practices because previous research showed that there is still a lot of ambiguity around the term OER and so-called 'dark-reuse' could be prevalent which cannot be measured in quantitative measurements alone.

"The second study was a qualitative study to improve our understanding how teachers assess OER and how they move from initial assessment to adoption. In this qualitative study teachers were asked to collaboratively assess OER within their teaching subject. The aim of our study was to characterize what elements teachers take into account when assessing OER quality and not to generalize what defines a quality OER. We also explored by asking teachers to create an association map before and after the three months in which teachers could explore OER, if their perception changed during. We choose this qualitative design because it provides rich insights into the elements teachers' take into account when assessing OER rather than a quantitative measurement in which teachers are asked to self-reflect how they assess OER.

"The follow-up study focuses on a subject community in which we will make use of a mixed-methods design. Qualitative data will be collected through interviews with teachers based on the five phases of the OER re-use process as defined by Clements and Pawlowski (2012). This data will be used to analyze how teachers make use of the subject community."

Viviane Vladimirschi used focus groups to assess the overall effectiveness of the intervention in her research. These focus group conversations consisted of semi-structured, open-ended questions.

> *"Focus groups are excellent for gaining new insights and assessing interventions. In my opinion, the biggest challenge is knowing what questions to ask in order to obtain useful data. I used Guskey's (2002) Multilevel Evaluation Framework to guide the semi-structured, open-ended interview questions. In my opinion, Guskey's model is effective and straightforward for educational interventions.*
>
> *"Although the use of mixed methods can be excellent to collect and compare different sources of data enhancing the quality of data and promoting convergence and confirmation of findings, the researcher must feel comfortable with and be knowledgeable with both quantitative and qualitative data collection and analysis. I would also not recommend quantitative data methods for small sample populations."*

Useful references for Interviews & Focus Groups: Ayres (2008); Bailey (1994); Bloor (2001); Morgan (1996)

Literature Review, Systematic Review and Meta-analysis

Literature reviews can be a good way to narrow down theoretical interests; refine a research question; understand contemporary debates; and orientate a particular research project. It is very common for PhD theses to contain some element of reviewing the literature around a particular topic. It's typical to have an entire chapter devoted to reporting the result of this task, identifying gaps in the literature and framing the collection of additional data.

Systematic review is a type of literature review that uses systematic methods to collect secondary data, critically appraise research studies, and synthesise findings. Systematic reviews are designed to provide a comprehensive, exhaustive summary of current theories and/or evidence and published research (Siddaway, Wood & Hedges, 2019) and may be qualitative or qualitative. Relevant studies and literature are identified through a research question, summarised and synthesized into a discrete set of findings or a description of the state-of-the-art. This might result in a 'literature review' chapter in a doctoral thesis, but can also be the basis of an entire research project.

Meta-analysis is a specialised type of systematic review which is quantitative and rigorous, often comparing data and results across multiple similar studies. This is a common approach in medical research where several papers might report the results of trials of a particular treatment, for instance. The meta-analysis then

statistical techniques to synthesize these into one summary. This can have a high statistical power but care must be taken not to introduce bias in the selection and filtering of evidence.

Whichever type of review is employed, the process is similarly linear. The first step is to frame a question which can guide the review. This is used to identify relevant literature, often through searching subject-specific scientific databases. From these results the most relevant will be identified. Filtering is important here as there will be time constraints that prevent the researcher considering every possible piece of evidence or theoretical viewpoint. Once a concrete evidence base has been identified, the researcher extracts relevant data before reporting the synthesized results in an extended piece of writing.

Literature Review: GO-GN Insights

Sarah Lambert used a systematic review of literature with both qualitative and quantitative phases to investigate the question "How can open education programs be reconceptualised as acts of social justice to improve the access, participation and success of those who are traditionally excluded from higher education knowledge and skills?"

> *"My PhD research used systematic review, qualitative synthesis, case study and discourse analysis techniques, each was underpinned and made coherent by a consistent critical inquiry methodology and an overarching research question.*
>
> *"Systematic reviews are becoming increasingly popular as a way to collect evidence of what works across multiple contexts and can be said to address some of the weaknesses of case study designs which provide detail about a particular context - but which is often not replicable in other socio-cultural contexts (such as other countries or states.) Publication of systematic reviews that are done according to well defined methods are quite likely to be published in high-ranking journals - my PhD supervisors were keen on this from the outset and I was encouraged along this path.*
>
> *"Previously I had explored social realist authors and a social realist approach to systematic reviews (Pawson on realist reviews) but they did not sufficiently embrace social relations, issues of power, inclusion/exclusion. My supervisors had pushed me to explain what kind of realist review I intended to undertake, and I found out there was a branch of critical realism which was briefly of interest. By getting deeply into theory and trying out ways of combining theory I also feel that I have developed a deeper understanding of*

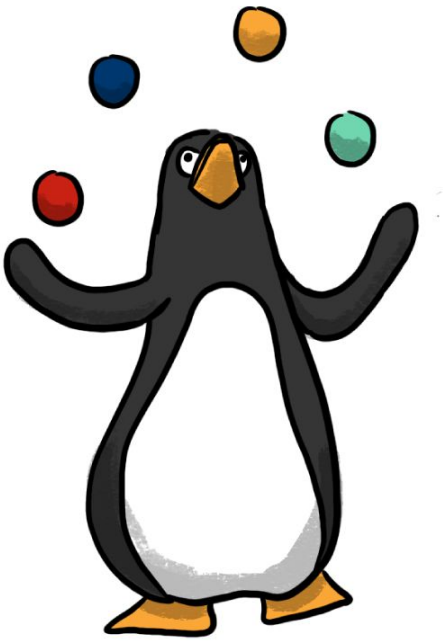
> *conceptual working and the different ways theories can be used at all stages of research and even how to come up with novel conceptual frameworks."*

Useful references for Systematic Review & Meta-Analysis: Finfgeld-Connett (2014); Lambert (2020); Siddaway, Wood & Hedges (2019)

Mixed Methods

Mixed methods is a research approach where searchers collect and analyse both quantitative and qualitative data within the same study (Shorten & Smith, 2017). Mixed methods research draws on potential strengths of both qualitative and quantitative methods. That approach allows researchers to explore diverse perspectives and uncover relationships that exist between research questions (Creswell, 2009).

In a mixed methods approach, researchers have the possibility to use exploratory research to uncover new areas of research and inter-disciplines (Dominguez & Hollstein, 2014). Mixed methods design allows a pragmatic perspective in the research (Morgan, 2014) that can be applied to action research involving participants in the research process (Ivankova, 2015). A mixed methods approach supports the articulation of different techniques to deepen the study of some dimensions while making triangulation of data possible. Using mixed methods allows the study of a given phenomenon in a broader and deeper perspective, in order to obtain richer and more varied data which might draw from several approaches or paradigms. (See also the discussion on p.15 of this handbook.)



Mixed Methods: GO-GN Insights

Aras Bozkurt used mixed-method and explanatory sequential design with a combination of methods for collection and analysis, including social network analysis, interview, observation and document analysis to identify interaction patterns and teacher-learner roles in connectivist MOOCs.

> *"The purpose of my doctoral dissertation is to identify interaction patterns and teacher-learner roles in connectivist massive open online courses (MOOCs). To accomplish this purpose, mixed method and explanatory sequential design was used. For data collection and analysis, social network*

analysis, interview, observation and document analysis was used. Research findings were interpreted with the perspectives of connectivism, rhizomatic learning and social network theory."

Jenni Hayman applied mixed-methods action research to determine the usefulness of an awareness and support strategy designed to increase the use of OER among post-secondary educators in Ontario.

> *"The method for my research was mixed method action research (MMAR) and it was defined by my institution as a requirement. My program was a Doctor of Education (Ed.D) at Arizona State University and it was considered a professional program rather than a PhD. Students in the program were expected to have a full-time, related professional career in addition to studying at a doctoral level. The timeline from program beginning to end, including defence of the dissertation was three years. I had some choice in the order of the mixed methods and selected a qualitative to quantitative data collection and analysis pathway that provide opportunities for me to learn more about educator needs and the quality of my instruments and method from colleagues and experts before launching the action of the study, professional development sessions for Ontario post-secondary educators, and collecting quantitative and qualitative data. I engaged in three cycles of research (a common practice for action research), each leading to more refined practices and greater participation. Based on some fantastic and creative qualitative analysis recommendations in Saldaña (2016) I used structural coding to analyse face-to-face participant data.*
>
> *"Although my personal tendency is toward qualitative methods, I found the requirement of a mixed method approach for my research extremely beneficial as a novice. I was required to learn and practice skills of both approaches and to learn how different types of data interact and combine to magnify insight. When qualitative and quantitative data agreed, this generated confidence for me that I was on the right path. When these data disagreed, I returned to the literature, and method descriptions to develop explanations and further refine my contexts and the contexts of my participants."*

Virginia Power is investigating the social, cultural and technical factors that mediate the relationship between social media affordances and the use of repositories for OER (ROER) using 'cultural probes' to collect data from 45 participants.

> *"I wanted to find a method that would provide evidence of the psychology involved in using social media affordances (likes, ratings, reviews) and felt that a largely qualitative method would be useful. I had wanted to undertake*

some socio-technical system design but this is likely to happen once the thesis is finished to test out findings.

"A largely qualitative approach was used, with cultural probes selected as the method for data collection. Cultural probes (Gaver et al., 1999) utilise tools and tasks enabling the participant to reflect on their working environment (either physical or virtual) facilitating a deeper insight into motivation and use of the environment with limited researcher influence. Consequently, two elements were chosen as potentially suitable for data collection – a research journal for self-reflection and screencasts that would elicit both audio and video recordings from each participant."

"Cultural probes if properly designed will often give users the opportunities to record their thoughts and feelings in their own particular context. They also provide users with independence and minimal interference from the researcher. Often cultural probes can be used to triangulate against other independent data, such as focus groups or usability studies with the aim to improve reliability. Users need to be clearly briefed on the purpose of the research and exactly what they need to do and the amount of time needed to transcribe the data should not be underestimated."

Paula Cardoso included interviews and surveys in her research conducted to understand the perceptions and practices of faculty in public higher education institutions in Portugal towards OERs.

"We understood it was advantageous to articulate qualitative and quantitative techniques, as it may reveal or deepen the study of some dimensions of the same reality. In this research, the mixed methods approach, with sequential character, was useful in a double perspective: on the one hand, it allowed us to articulate different techniques to deepen the study of some dimensions in analysis, and on the other hand, it also presented advantages in terms of data triangulation. Finally, using mixed methods allows the study of a given phenomenon in a broader and deeper perspective, in order to obtain richer and more varied data, which can be better explored, giving greater strength and rigor to research."

Useful references for Mixed Methods: Creswell (2009); Dominguez & Hollstein (2014); Edwards (2010); Ivankova (2015); Morgan (2014); Shorten & Smith (2017); Tashakkori & Teddlie (2010)

Narrative Research

Narrative research aims to explore and conceptualise human experience as it is represented in textual form. Aiming for an in-depth exploration of the meanings people assign to their experiences, narrative researchers work with small samples of participants to obtain rich and free-ranging discourse.

Useful references for Narrative Research: Salkind (2002); Clandinin & Connelly (2004)

Observation (Naturalistic & Analogue)

Observational research is a social research data collection tool that involves the direct observation of phenomena in their natural setting. Naturalistic observation has no intervention by a researcher. It is simply studying behaviours that occur naturally in natural contexts, unlike the artificial environment of a controlled laboratory setting. It permits observing and recording authentic behaviour. In participant observation, the researcher also intervenes in (and influences) the environment.

Useful references for Observation: Angrosino (2007); Levine et al. (1980); McLean & Connor (2018)

Phenomenography

Phenomenography is a qualitative research methodology that investigates the qualitatively different ways in which people experience something or think about something (Bowden et al., 1997; Ashworth & Lucas, 1998). Phenomenography aims at studying the variation of ways people understand phenomena in the world. In simpler terms, phenomenography explores the variation in how different people conceive of learning experiences (Akerlind, 2005). Those who design and deliver professional learning can use empirical research rather than anecdotal evidence to inform the development and delivery of meaningful professional learning experiences.

Phenomenography: GO-GN Insights

Penny Bentley used phenomenography to explore the experience of professional learning through open education (PLOE) from the perspective of teachers as adult learners. The study was conducted to inform the design and delivery of meaningful

professional learning to other teachers seeking to learn about STEM education on the open Web.

> *"Phenomenography is not a widely used methodology. There is variation in literature on phenomenography around aspects of theory, methodology and method. This made it difficult for me, as a novice, solo researcher to comprehend and discuss with my supervisors who are not experts in the field. It is time consuming to conduct phenomenographic data analysis on a huge amount of data.*
>
> *"I wanted to explore, understand and describe the different ways teachers experienced PLOE, from their perspective. This was an interpretive activity, situating my research in the interpretive paradigm. Also, describing the perspectives of teachers, in terms of what PLOE means to them, was research of a qualitative nature. However, there are a range of methodologies within the interpretive paradigm, such as ethnography, grounded theory, phenomenology and phenomenography.*

In order to justify my choice for this study I needed to consider the differences between these methodologies. I was not studying the culture of a group of teachers using the open Web to learn about STEM education (ethnography), although culture may be an aspect of how the phenomenon of PLOE is experienced. Nor was I generating a theory to explain the cause of social processes and interactions when teachers engaged in PLOE (grounded theory), although I was interested in understanding and describing the different ways these processes and interactions are experienced. Even though human experience is the focus of phenomenology and phenomenography, it is the phenomenographic focus on variation of experience, rather the focus on essence of experience made by phenomenologists, that made a difference to which methodology and methods I chose.

> *"Phenomenography enables me to describe variation in the lived experiences of PLOE from the perspective of teachers experiencing this phenomenon. This is important since much of the literature on professional learning does not include the different views of teachers, but focuses on aspects of professional learning that others consider important. It is this focus on variation of experience, particularly the meaning of experience, that I see as having a practical application to the professional learning of Australian teachers of STEM subject areas.*
>
> *"If you are new to research, and working alone, I would advise you not to conduct a phenomenographic study unless you have people who are familiar with this methodology to support you. Give yourself plenty of time and limit the number of participants what is recommended in the literature. If you don't know any phenomenographers in your institution, seek out networks of*

practice on social media. Read the seminal literature on phenomenography, then read it again."

A phenomenographic data collection was conducted by Chrissi Nerantzi using a collective case study approach to gain insights into the collective lived collaborative open learning experience in two authentic cross-institutional academic development settings with collaborative learning features.

> *"Twenty two individual phenomenographic interviews with academic staff were conducted and coded. The findings illustrate that collaborative open learning was experienced as two dynamic immersive and selective patterns. Boundary crossing as captured in the categories of description and their qualitatively different variations, shaped that experience and related to modes of participation; time, place and space; culture and language as well as diverse professional contexts. Facilitator support and the elasticity of the design also positively shaped this experience. The community aspect influenced study participants' experience at individual and course level and illuminated new opportunities for academic development practice based on cross-boundary community-led approaches. The findings synthesised in the phenomenographic outcome space, depicting the logical relationships of the eleven categories of description in this study, organised in structural factors, illustrate how these contributed and shaped the lived experience, together with a critical discussion of these with the literature, aided the creation of the openly licensed cross-boundary collaborative open learning framework for cross-institutional academic development, the final output of this study.*

> *"Doing phenomenography on your own can be challenging. It's worth considering doing the analysis with a colleague and discussing this. Large amounts of data as everything counts and is used, which can be time consuming."*

Useful references for Phenomenography: Åkerlind (2005); Ashworth & Lucas (1998); Bowden. & Green (2005); Bowden & Walsh (2000); Marton (1981); Marton (1986); Marton & Booth (1997); Tight (2016)

Phenomenology

Phenomenology is the study of phenomena. It has its roots in the philosophical movement initiated by Husserl (Beyer, 2011) which suspended traditional philosophical approaches which try to understand the fundamental nature of reality in favour of focusing on

analysis of phenomena as they are experienced. This approach allows for an objective appreciation of phenomena that are considered to be subjective.

Phenomenology has been applied extensively in a range of diverse disciplines (Friesen et al., 2012). In educational science, phenomenological descriptions are used to articulate the interests, aims, approaches, cultures, interactions, structures and reflections of educators and/or learners in a particular context.

Phenomenology: GO-GN Insights

Sarah Hutton conducted in-depth interviews with students and content analysis to connect shared internal goals supported by participation in an open publishing model where students are provided the opportunity to self-publish openly online or contribute to OER materials for the course.

> *"A phenomenological case study provides the opportunity for creating a rich narrative surrounding a shared experience. This method can help researchers establish a better understanding of individual meanings, and how subjects uniquely comprehend the world around them. Phenomenology and grounded theory pair well together for data collection and analysis, allowing for a more natural emergence of new ideas and thematic elements across a shared experience.*
>
> *"A disadvantage to this type of approach is the sheer volume of data that must be collected and sorted through to create that narrative. While recommendations on numbers of study participants may vary slightly between researchers, the more data that is collected over a longitudinal period, the stronger a pattern can be indicated as interviews are analyzed. In-depth interviews produce a large amount of data for analysis, and for a course case study, 3 interviews should be completed (beginning, middle, end) to complete a longitudinal thread of student experience and development throughout the course. Another disadvantage is that, similar to other qualitative data methods, phenomenology may be taken less seriously by policy makers than other larger-scale quantitative studies."*

Michael Paskevicius used a phenomenological approach with self-identifying open education practitioners. This explores how OEPs are being actualised in formal higher education and impacting learning design, and describes the ways educators are bringing elements of openness into their everyday teaching and learning practice through educational technologies.

> *"I employed an empirical phenomenological approach in my PhD study to investigate the personal social construction and 'lifeworld' human experience of individuals engaging with OEP (Giorgi, 1997; Gray, 2013). At the core of*

> *phenomenological research is a pursuit of understanding mental directedness or consciousness by investigating individuals' explanations grounded in their subjective experiences (Aspers, 2009). Empirical phenomenological research seeks to portray the essence of the conscious experience of others, essentially how they perceive the world, exploring what their experiences means to them, and provide a comprehensive description while recognizing the importance of social structure and context (Moustakas, 1994). Social structures are represented through the individual's interpretation and construction of meaning in the world, and this social meaning construction can be studied empirically by the researcher (Aspers, 2009). The phenomenological approach aims to understand the general or typical essential structures of individual experience, based on the descriptions of those experiences. In doing so, I seek to understand not what 'is' in the world but to understand why conscious individuals say that something 'is' (Giorgi, 1997).*
>
> *"Trialing research questions can strengthen a phenomenological study as it allows one to engage with and become familiar with the research space, learn about the context in which individuals of interest work, and gather feedback from potential participants or those operating in similar situations (Aspers, 2009). The interview questions, conducted using the Zoom synchronous meeting service, were trialed first with my supervisor, who uses open educational practices in her undergraduate and graduate teaching. My supervisor was able to provide some feedback on the questions from her perspective as a faculty member. As a result of this process, we adjusted some of the language and sequencing of the questions."*

Jessica O'Reilly includes an interpretivist phenomenological analysis (IPA) methodology in her study of OER enabled pedagogy.

> *"The idiographic focus of the IPA approach fits very well with my research question, which is interpretivist, emergent, and very focused on contextualized individual experience and sensemaking. One clear advantage that I see is the combination of psychological, interpretive, and idiographic "lenses" within the approach. IPA is well-suited, I think, to questions concerned with the experiences of a fairly concentrated and homogenous participant sample. A potential disadvantage to my IPA study will be the reliance upon interview data and the huge amount of work involved with transcription and analysis."*

Useful references for Phenomenology: Clandinin & Connelly (2004); Friesen, Henriksson & Saevi (2012); Giorgi (1997); Gray (2014); Manen (2018); Maxwell (2013); Smith, Flowers & Larkin (2009)

Social Network Analysis

Social media analytics is the process of gathering and analysing data from social networks. (Scott, 2000). Social Network Theory is the study of how people or groups interact with others inside their network. The three types of social networks are ego-centric networks, socio-centric networks, and open-system networks (Borgatti, & Lopez-Kidwell, 2011).

The objective of social network analysis (SNA) is to understand the interactions between each of the members of the network. These connections, called relationships or ties, are at the heart of what this analysis seeks to study and understand. The reasons why the individuals interact and how they interact their level of closeness (Borgatti et al., 2009). SNA provides both qualitative and quantitative data of online learning communities.

Social Network Analysis: GO-GN Insights

Aras Bozkurt used SNA to track digital footprints of online participants and map and visualize online learning community.

> *"For data collection and analysis, social network analysis, interview, observation and document analysis was used. Research findings were interpreted with the perspectives of connectivism, rhizomatic learning and social network theory.*
>
> *"According to the demographic findings of the research, learners in connectivist massive open online networks are distributed globally in time and place, many participate from English spoken countries, and 89% of the learners come from low-context cultures while 11% comes from high context cultures. Participants are individuals that are somehow connected to the education field; or students or instructors in higher education. When examined in terms of interaction patterns, unified-tight crowd community pattern was observed in connectivist massive open online course networks. The nodes in this kind of networks have strong connections to one another and significant connections that bridge sub-groups. Learners of this type of networks tend to communicate with each other frequently and share a common interest. These networks are composed of a few dense and/or densely interconnected groups where conversations usually swirl around and increase its density towards the center, involving different people at different times.*

> *"Research findings additionally demonstrated that connectivist learning environments require relatively few hops to communicate and interact with the learning community, and confirmed the theses proposed in the Small World Phenomenon and the Global Village. SNA provides both qualitative and quantitative data of online learning communities. However, it fails to provide phenomenological qualitative data."*

Some researchers collect this phenomenological data separately. For example, in addition to analysing network structures, Katy Jordan held co-interpretive interviews with 18 participants, to understand the significance and construction of their academic social networks.

> *"My PhD study addressed the question of how academics use dedicated social networks through mixed methods social network analysis. First, an online survey was conducted to gain contextual data and recruit participants (n = 528). Second, ego-networks were drawn up for a sub-sample of 55 academics (reflecting a range of job positions and disciplines). Ego-networks were sampled from an academic SNS and Twitter for each participant. Third, co-interpretive interviews were held with 18 participants, to understand the significance of the structures and how the networks were constructed.*

> *"My methods changed direction (subtly) twice during the course of my PhD. The focus was always on the structure of academic online social networks, but the level at which I looked at the networks changed. Originally I had planned to look at networks at a larger scale - such as the entire UK HE sector on Academia.edu. I changed tack to focus on academics' individual (personal, ego-) networks instead, for two reasons. First, ethically, it is a lot more sound to capture an ego-network - at this level, you can get the participants' consent. Second, in order to be able to understand the structures involved. For example, I could see interesting structural features in the OU networks, but network metrics can only tell you so much. By sampling personal networks, the structures could be meaningfully discussed with the participants themselves, in order to understand the significance and characteristics of different network features from their perspective. Combining digital (scraped) data with co-interpretive interviews offers much greater insight into the digital, open practices behind the network structures.*

Useful references for Social Network Analysis: Borgatti & Lopez-Kidwell (2011); Borgatti et al. (2009); Dominguez & Hollstein (2014); Edwards, G. (2010); Hansen, Shneiderman & Smith, (2010); Jordan (2018); Kozinets (2015); Newman (2018); Scott (2000); Wenger, Trayner & de Laat (2011)

Surveys & Questionnaires

Surveys involve asking a series of questions to participants. They can be administered online, in person, or remotely (e.g. by post/mail). The data collected can be analysed quantitatively or qualitatively (or both). Researchers might carry out statistical surveys to make statistical inferences about the population being studied. Such inferences depend strongly on the survey questions used (Solomon, 2001) meaning that getting the wording right is crucial. For this reason, many test out surveys in pilot studies with smaller populations and use the results to refine their survey instrument.

Sampling for surveys can range between self-selection (e.g. where a link is shared with members of a target population in the hope they and others contribute data and share the survey) through to the use of specialised statistical techniques ("probability sampling") that analyse results from a carefully selected sample to draw statistical conclusions about the wider population. Survey methodologies therefore cover a range of considerations including sampling, research instrument design, improving response rates, ensuring quality in data, and methods of analysis (Groves et al., 2011).

One common question format is to collect quantitative data alongside qualitative questions. This allows a more detailed description or justification for the answer given to be provided. Collecting ordinal data (e.g. ranking of preferences through a Likert scale) can be a way to make qualitative data more amenable to quantitative analysis. But there is no one superior approach: the crucial thing is that the survey questions and their phrasing aligns with the research question(s) correctly.

Surveys are widely used in education science and in the social sciences more generally. Surveys are highly efficient (both in terms of time and money) compared with other methods, and can be administered remotely. They can provide a series of data points on a subject which can be compared across the sample group(s). This provides a considerable degree of flexibility when it comes to analysing data as several variables may be tested at once. Surveys also work well when used alongside other methods, perhaps to provide a baseline of data (such as demographics) for the first step in a research study. They are also commonly used in evaluations of teaching & learning (i.e. after an intervention to assess the impact).

However, there are some noteworthy disadvantages to using surveys. Respondents may not feel encouraged to provide accurate answers, or may not feel comfortable providing answers that present themselves in a unfavourable manner (particularly if the survey is not anonymous). "Closed" questions may have a lower validity rate than other question types as they might be interpreted differently. Data errors due to question non-responses may exist creating bias. Survey answer options should be selected carefully because they may be interpreted differently by respondents (Vehovar & Katja Lozar, 2008).

Surveys & Questionnaires: GO-GN Insights

Marjon Baas collected quantitative data through a questionnaire among teachers within an OER Community of Practice to explore the effect of the activities undertaken to encourage the use of the community on teachers' behaviour in relation to OER.

> *"I used several theoretical models (Clements and Pawlowski, 2012; Cox and Trotter, 2017; Armellini and Nie, 2013) to conceptualise different aspects (that relate to) OER adoption. This enabled me as a researcher to design my specific research instruments."*

Judith Pete had a deliberate selection of twelve Sub-Saharan African universities across Kenya, Ghana and South Africa with randomly sampled students and lecturers to develop a representative view of OER. Separate questionnaires were used for students (n=2249) and lecturers (n=106).

> *"We used surveys to collect data across three continents. Online survey tools were very helpful in online data collection and, where that was not possible, local coordinators used physical copies of the survey and later entered the information into the database. This approach was cost-effective, versatile and quick and easy to implement. We were able to reach a wide range of respondents in a short time. Sometimes we wondered, though, whether all those who responded had enough time to fully process and understand the questions that they were being asked. We had to allocate a significant amount of time to curating the data afterwards."*

Samia Almousa adopted Unified Theory of Acceptance and Use of Technology (UTAUT) survey questionnaire, along with additional constructs (relating to information quality and culture) as a lens through which her research data is analysed.

> *"In my research, I have employed a Sequential Explanatory Mixed Methods Design (online questionnaires and semi-structured interviews) to examine the academics' perceptions of OERs integration into their teaching practices, as well as to explore the motivations that encourage them to use and reuse OERs, and share their teaching materials in the public domain. The online questionnaire was an efficient and fast way to reach a large number of academics. I used the online survey platform, which does not require entering data or coding as data is input by the participants and answers are saved automatically (Sills & Song, 2002).*
>
> *Using questionnaires as a data collection tool has some drawbacks. In my study, the questionnaire I developed was long, which made some participants choose their answers randomly. In addition, I have received many responses from academics in other universities although the questionnaire was sent to the sample university. Since I expected this to happen, I required the participants to write the name of their university in the personal information section of the questionnaire, then excluded the responses from outside the research sample. My advice for any researcher attempting to use questionnaires as a data collection tool is to ensure that their questionnaire is as short and clear as possible to help the researcher in analysing the findings and the participants in answering all questions accurately. Additionally, personal questions should be as few as possible to protect the identity and privacy of the participants, and to obtain the ethical approval quickly."*

Olawale Kazeeem Iyikolakan adopted a descriptive survey of the correlational type. The author research design examines the relationship among the key research variables (technological self-efficacy, perception, and use of open educational resources) and to identify the most significant factors that influence academic performance of LIS undergraduates without a causal connection.

> *"The descriptive research design is used as a gathering of information about prevailing conditions or situations for the purpose of description and interpretation (Aggarwal, 2008). My research design examines the relationship among the key research variables (technological self-efficacy, perception, and use of open educational resources) to identify the most significant factors that influence academic performance of Library & Information Science undergraduates without a causal connection. Ponto (2015) describes that descriptive survey research is a useful and legitimate*

approach to research that has clear benefits in helping to describe and explore variables and constructs of interest by using quantitative research strategies (e.g., using a survey with numerically rated items.

"The reason for the choice of descriptive survey research instead of ex-post-facto quasi-experimental design is that this type of research design is used to capture people's perceptions, views, use, about a current issue, current state of play or movements such as perception and use of OER. This research design comes with several merits as it enables the researcher to obtain the needed primary data directly from the respondents. Other advantages include: (1) Using this method, the researcher has no control over the variable; (2) the researcher can only report what has happened or what is happening. One of the demerits of this type of research design is that research results may reflect a certain level of bias due to the absence of statistical tests."

Useful references for Surveys & Questionnaires: Aggarwal (2008); Fowler (2014); Groves et al., 2011); Lefever, Dal & Matthíasdóttir (2007); Ponto (2015); Sills & Song (2002); Solomon (2001); Vehovar & Manfreda (2008); Vehovar, Manfreda, & Berzelak (2018)

Conclusion & Reflection Prompts

This handbook has presented research method as a journey from "deep" philosophical considerations to specific approaches to collecting and analysing data. Obviously there is much more that could be said: many books have been written about individual methods and philosophical takes described above. But hopefully this guide provides a useful overview of a topography that can be confusing and intimidating.

Looking in more detail at how different methods have been used by doctoral researchers from GO-GN can be a useful way to see the possibilities with different methodologies. You can find a list of completed theses at the end of this handbook. For future editions we hope to incorporate more insights from the network and cover even more methods.

We have shown how openness can be a relevant consideration in all aspects of the research process. In conclusion, we invite you to reflect on the ways in which openness can frame or enhance your own research.

How do you frame your research? What motivates it?

- Describing what is happening (e.g. learner diversity in MOOCs)
- Identifying patterns (e.g. how are networks changing learner interactions?)
- Challenging existing narratives (e.g. 'digital native')
- Focus on something overlooked (e.g. importance of sociocultural factors)
- Supporting professional practice (e.g. educator development)
- Developing new theories
- Describing new trends (e.g. open education)
- Refine/redefine roles (e.g. MOOCs)

What will be the value of answering your research question? Can open approaches enhance or add value?

- Directly influencing practice
- Producing tools
- Sharing data for re-use
- Open access publication
- Developing open networks

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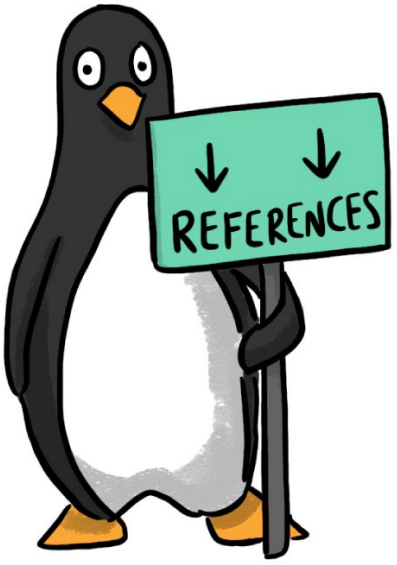

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Here you can find details of the PhD theses that have been completed by researchers who have contributed their insights to this handbook. By consulting these studies you can see how different methods have been applied. (Download the full collection of doctoral theses completed by GO-GN members at http://go-gn.net/theses/.)

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